

SELECTED
WATER
RESOURCES
ABSTRACTS



VOLUME 2, NUMBER 15
AUGUST 1, 1969

W69-06001 -- W69-06420

UNIVERSITY OF KENTUCKY
WATER RESOURCES INSTITUTE
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior



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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources. WRSIC is not presently prepared to furnish loan or retention copies of the publications announced.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas. Centers, and their subject coverage, now in operation are:

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Water Resources Scientific
Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

PLASTIC FLOW AND PRESSURE MELTING IN THE DEFORMATION OF ICE I.

Cambridge Univ. (England). Cavendish Lab.

P. Barnes, and D. Tabor.

Comm of Snow and Ice. Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 303-315, 1967. 13 p, 8 fig, 1 tab, 15 ref.

Descriptors: *Ice, *Melting, *Plastic deformation, Flow, Mechanical properties, Physical properties, Thermodynamics, Rheology, Temperature, Pressure, Crystal growth.

Identifiers: Plastic flow, Regelation, Pressure melting.

Previous studies on the indentation of ice indicated some anomalies in its deformation properties near the melting point. Above the pressure melting temperature, there was a considerable increase in the flow rate of ice. In addition, the deformed ice was characterized by its large grain size and loss of bubbles. Recent experiments furnish data from which it is possible to give a quantitative treatment of the deformation mechanisms involved in the pressure melting regime. It is concluded that, above the pressure melting temperature, a liquid-like layer is formed at the ice grain boundaries. This process accounts for the bubble loss and formation of large grains. Together with a surface regelation process, it also accounts for the major part of the increase in flow rate observed. (Knapp-USGS)

W69-06270

02. WATER CYCLE

2A. General

SOME MAPS OF ISANOMALIES IN ENERGY BALANCE CLIMATOLOGY,

California Univ., Los Angeles. Dept. of Geography. For primary bibliographic entry see Field 02B.

W69-06050

LOSS RATES ON SELECTED CATCHMENTS IN VICTORIA,

Water Research Foundation of Australia, King-sford.

For primary bibliographic entry see Field 02D.

W69-06085

THE HYDROLOGIC CYCLE AND THE WATER BALANCE IN NATURE,

Research Inst. for Water Resources Development, Budapest (Hungary).

G. Kienitz, K. Szczesztay, and K. Ubell.

2nd Int Postgrad Course on Hydrol Method for Develop Water Resources Manage, Budapest, Hung, Jan-July 1968, Manual No 8, 1968. 197 p, 62 fig, 18 tab, 44 ref.

Descriptors: *Hydrologic budget, *Water balance, *Hydrologic cycle, Desalination, Surface waters, Groundwater, Climatology, Precipitation (Atmospheric), Evapotranspiration, Meteorology, Statistical methods, Data collections, Network design.

Identifiers: *Technical manuals, *Textbooks.

The concept of the hydrologic cycle is outlined and methods for computing the water balance in natural and man-modified hydrologic systems are given in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. Data processing methods are reviewed. The water balance is subdivided for discussion into atmospheric balance, surface water balance, groundwater, and meteorological considerations. Evapotranspiration and precipitation computations

are given special consideration. Desalting is suggested as a way of increasing fresh water supplies in water-short areas. (Knapp-USGS)

W69-06227

W69-06018

SOME MAPS OF ISANOMALIES IN ENERGY BALANCE CLIMATOLOGY,

California Univ., Los Angeles. Dept. of Geography.

Werner H. Terjung.

Arch Meteorol, Geophys, and Bioklimatol, Ser B, No 16, pp 279-315, 1968. 36 p, 28 fig, 1 tab, 15 ref.

Descriptors: *Climatology, *Energy budget, Solar radiation, Heat flow, Heat balance, Temperature, Regression analysis, Synoptic analysis.

Identifiers: Energy balance maps, Bowen ratio, Radiation efficiency.

HYDROLOGICAL FORECASTING,

Research Inst. for Water Resources Development, Budapest (Hungary).

O. Starosolszky, K. Szczesztay, and K. Ubell.

2nd Int Postgrad Course on Hydrol Methods for Develop Water Resources Manage, Budapest, Hung, Jan-July, Manual No 9, 1968. 140 p, 91 fig, 6 tab, 44 ref.

Descriptors: *Forecasting, *Water management (Applied), River forecasting, Runoff forecasting, Flood forecasting, Streamflow forecasting, Estimating, Statistical methods, Synthetic hydrology, Network design, Data collections, Freezing, Thawing, Water levels, Water level fluctuations.

Identifiers: *Textbooks, *Technical manuals.

Hydrological forecasting methods are given in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. The design of data collection networks for forecasting systems and the organization of forecasting networks on the local through the national government levels are discussed. Methods are given for using data to obtain forecasts for river flow, river stage, lake stage, ice formation, ice melting, groundwater levels, and groundwater discharge. (Knapp-USGS)

W69-06228

A series of world maps of isanomalies of annual and seasonal global radiation, net radiation, latent heat flux, sensible heat flux, maps of residuals from regression, radiation efficiency, and the Bowen Ratio have been constructed on the data base of BUDYKO'S Atlas of the Heat Balance of the Earth, 1963. Among the major features observed was the dissimilarity in patterns of isanomalies for the eastern and western sectors of the world's semi-permanent subtropical highs and the great difference between oceanic and continental surfaces. (Knapp-USGS)

W69-06050

PROBABILITY FORECASTS OF 30-DAY PRECIPITATION,

Virginia Polytechnic Inst., Blacksburg. Dept. of Statistics.

John W. Philpot, and Richard G. Krutchkoff.

Virginia Water Resources Res Center Rep, Feb 1969. 113 p, 13 fig, 30 tab, 19 ref, 9 append.

OWRR Proj No A-027-VA.

Descriptors: *Forecasting, *Precipitation (Atmospheric), *Weather forecasting, *Statistical models, Probability, Reliability, Computer models, Computer programs, Digital computers.

Identifiers: Weather Bureau, Forecast improvement, Precipitation probability.

A process for improving the usefulness of the Weather Bureau's 30-day precipitation forecasts is proposed. A computer program for generating an estimated conditional probability distribution of monthly local rainfall is described and a program listing is included. Input data are past weather bureau forecasts, local precipitation data, and current weather bureau forecast. (Knapp-USGS)

W69-06205

RAINSTORMS AND HAIL,

Gidrometeorologicheskii Institut, Leningrad (USSR). High-Altitude Geophysics Inst.

G. K. Sulakvelidze.

Available from Clearinghouse as TT 68-50466; \$3.00 paper copy and \$0.65 in microfiche. Trans Liveyne Osadki i Grad, Leningrad, Gidrometeoizdat 1969. 310 p, 94 fig, 43 tab, 276 ref.

Descriptors: *Precipitation (Atmospheric), *Hail, *Rain, *Cloud physics, Artificial precipitation, Cloud seeding, Climatology, Condensation, Meteorology, Air circulation, Weather modification, Convection.

Identifiers: *USSR, Convective storms.

A monograph presents theoretical and experimental results concerning the formation of rain from convective clouds. The study was conducted by members of the High-Altitude Geophysics Institute USSR, during 1956-1966. A new hypothesis of hail formation is proposed, and on its basis a method is developed for modifications of convective clouds with the aim of preventing heavy hailstorms. An account is given of hail forecasting reliability based on an analysis of the vertical atmospheric stability and the hypothesis of hail formation presented in this work. Radar methods of investigating rain and hail clouds are discussed and the results are given. The monograph is intended for specialists in the field of cloud physics and weather control, meteorologists, and postgraduate students on hydrometeorology. (Knapp-USGS)

THE HEAT BUDGET OF A MELTING COVER OF SEA ICE,

McGill Univ., Montreal (Quebec). Ice Research Project.

For primary bibliographic entry see Field 02C.

W69-06263

GLACIER MASS BUDGET AND MESOSCALE WEATHER IN THE AUSTRIAN ALPS 1964 TO 1966,

Innsbruck Univ. (Austria). Inst. of Meteorology and Geophysics.

For primary bibliographic entry see Field 02C.

W69-06267

THE GREENLAND MASS BALANCE FLUX DIVERGENCE CONSIDERATIONS,

Cold Regions Research and Engineering Lab., Hanover, N. H.

For primary bibliographic entry see Field 02C.

W69-06268

2B. Precipitation

THE AREAL EXTENSION OF RAINFALL RECORDS: AN ALTERNATIVE MODEL,

University Coll. of Wales, Aberystwyth. Dept. of Geography.

D. J. Unwin.

J Hydrol, Vol 7, No 4, pp 404-414, Apr 1969. 11 p, 2 fig, 4 tab, 20 ref.

Descriptors: *Rainfall, *Statistical models, Regression analysis, Statistical methods, Synoptic analysis, Climatology, Meteorology.

Identifiers: Trend surface analysis, Snowdonia (Wales).

Trend surface analysis is proposed as an alternative to conventional regression analysis for analyzing areal rainfall totals. The method was tested using data from Snowdonia, North Wales and was found to be slightly more efficient. The area shows a strong effect of altitude on rainfall but has a superimposed decrease in rainfall in the SW-NE direction because of prevailing rain-bearing SW winds. Trend surface analysis treats the areal variation of rainfall as a regional component independent of altitude with residuals ascribed to the altitude effect. (Knapp-USGS)

Field 02—WATER CYCLE

Group 2B—Precipitation

W69-06214

PRECISION MEASUREMENTS OF WATER DROPLET EVAPORATION RATES,
New Mexico Univ., Albuquerque. Dept. of Physics and Astronomy.
For primary bibliographic entry see Field 02D.
W69-06236

2C. Snow, Ice, and Frost

FREEZING IN FOREST SOIL AS INFLUENCED BY SOIL PROPERTIES, LITTER, AND SNOW,
Minnesota Univ., St. Paul. School of Forestry.
David B. Thorud, and David A. Anderson.
Univ. Minn. Water Resources Res. Center Bull. 10, Jan 1969. 41 p, 19 fig, 12 tab, 19 ref, 1 append. OWRR Proj No A-004-MINN.

Descriptors: *Freezing, *Soils. *Forest soils, Frost protection, Frozen soils, Frost, Snow cover, Runoff, Infiltration, Soil physical properties.
Identifiers: Freezing rate (Soils).

Freezing of forest soil was studied in small soil columns using 28 cu ft freezers. The blocks of soil were 10 1/2 in. deep, 13 in. long, and 8 1/2 in. wide, and were undisturbed sequences carefully cut in the field. The effect on freezing of soil type differences was less than the effect of variations in litter and snow cover. Loamy sand froze in 28% less time than a silt loam. Bare soil froze 55% faster than litter covered soil. A 2-in. snow layer increased freezing time, but snow and pine litter together increased freezing time 54% over the time for the same thickness of litter alone, and 123% compared to snow alone. Water in the litter decreased freezing time as much as 61%. (Knapp-USGS)

W69-06028

CLIMATOLOGY OF SEVERE WINTER STORMS IN ILLINOIS,
Illinois State Water Survey, Urbana.
Stanley A. Changnon, Jr.

Ill. State Water Surv. Bull 53, 1969. 45 p, 38 fig, 32 tab, 29 ref.

Descriptors: *Illinois, *Climatic data, *Storm structure, *Snowfall, Frequency, Meteorological data, Damages, Blizzards, Hydrologic budget, Ice, Winds, Synoptic analysis, Probability.
Identifiers: *Winter storms, Snowstorms.

Damaging winter storms with glazing conditions and more than 6 in. of snow occur several times a year in Illinois. Winter storm data for the period 1900-1960 are analyzed. The information shows that storms usually center in northwestern Illinois and are characterized by 6 in. snow depth or more over an average area of 7,500 sq mi. Point snowfall of 12 in. and glaze of 2 in. thickness has occurred in all areas of the state, and a maximum of 37 in. at a point occurred in a 1900 storm. The greatest direct loss to property was in 1924 when a 12.4 million dollar loss was recorded. The study shows that 5 weather types lead to the production of severe winter storms in Illinois. The Colorado low produces approximately 45% of the storms and is largely responsible for the most widespread heavy snow and greater overall damage than the other weather types. (Gabriel-USGS)

W69-06210

THE LONGITUDINAL VELOCITY PROFILE OF LARGE ICE MASSES,
Melbourne Univ., Parkville (Australia) Antarctic Div.

W. Budd.

Comm. of Snow and Ice, Proc. Gen. Assembly of Bern (Sept-Oct 1967), Int. Ass. Sci. Hydrol., Pub No 79, pp 58-77, 1967. 20 p, 5 fig, 2 tab, 15 ref.

Descriptors: *Glaciers, *Movement, *Rheology, *Antarctic, Mathematical models, Ice, Non-newtonian flow, Mechanical properties, Plasticity.

Viscosity, Shear stress, Shear strength, Shear drag, Slopes.
Identifiers: *Wilkes dome, Convergent flow, Divergent flow, Ice sheets, Continental glaciers.

Detailed measurements of ice movement, strain rates, ice thickness and elevation of the Wilkes local ice cap have provided means of testing various theories of ice movement, and thereby have provided information on the flow law of the ice. An analysis has been made of 2-dimensional ice flow to determine the longitudinal strain rate and velocity as a function of the ice mass dimensions and the flow law parameters of ice. It has been necessary to use a flow law consisting of a linear term plus a high power term to cover both the high shear at the base and the low but fluctuating longitudinal strain rates. By the application of this theory to the analysis of the Wilkes dome data it is found that the basal friction varies as the smoothed surface and is related to the ice thickness and velocity, depending on a high power in the flow law. Fluctuations in surface slope over smaller distance give rise to small changes in longitudinal stress and similar changes in the strain rate, but the magnitude of these changes at low stresses involves only a small power in the flow law. An extension of the analysis by Weertman (1957) for 3-dimensional ice shelf spread has been carried out to drive the effect of an arbitrary transverse strain on the longitudinal velocity gradient. This allows the above results to be applied to 3-dimensional diverging or converging flow. This analysis has been found successful in explaining the lower longitudinal strain rates over the 'less active' side of the Wilkes dome where transverse extension is the dominant strain rate. (Knapp-USGS)

W69-06257

GLACIAL EROSION,
Bristol Univ. (England), H. H. Wills Physics Lab.
J. F. Nye and P. C. S. Martin.
Comm. of Snow and Ice, Proc. Gen. Assembly of Bern (Sept-Oct 1967), Int. Ass. Sci. Hydrol., Pub No 79, pp 78-86, 1967. 9 p, 2 fig, 10 ref.

Descriptors: *Glaciers, *Erosion, *Scour, Topography, Movement, Rheology, Abrasion, Cavitation, Friction, Shear stress, Slopes, Ice, Mechanical properties, Plasticity, Shear drag.
Identifiers: *Glacial erosion.

Slip-line fields are discussed for a perfectly plastic glacier moving over an irregular bed. It is argued that erosion will proceed in such a way that the bed becomes either a slip-line or an envelope of slip-lines. This implies that there is an upper limit to the longitudinal concave curvatures of the bed, but no corresponding limit to convex curvatures. The mechanism provides a natural explanation for the typical long profiles of glacier valleys. Examples are given to show that so-called rock bars can form at places where there is no obviously harder rock, and that, conversely, an obviously harder rock does not necessarily form a rock bar. (Knapp-USGS)

W69-06258

EROSIVE PROCESSES WHICH ARE LIKELY TO ACCENTUATE OR REDUCE THE BOTTOM RELIEF OF VALLEY GLACIERS,
For primary bibliographic entry see Field 02J.
W69-06259

RIFTS AT THE FOOT OF BEARDMORE GLACIER, ANTARCTICA,

Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics; and Scott Polar Research Inst., Cambridge (England). Ian Collins, and Charles Swithinbank.

Comm. of Snow and Ice, Proc. Gen. Assembly of Bern (Sept-Oct 1967), Int. Ass. Sci. Hydrol., Pub No 79, pp 109-114, 1967. 6 p, 4 fig, 5 ref.

Descriptors: *Glaciers, *Antarctic, Floating, Rheology, Ice, Movement, Mechanical properties, Plasticity, Yield strength, Strength, Deflection.
Identifiers: *Antarctic shelf ice, Ice rifts.

Series of rifts have frequently been observed on Antarctic glaciers. In the past these have been interpreted as annual phenomena, and measured values of the separation of consecutive rifts used to estimate the mass budget of the Antarctic continent. However, measurements of the velocity of ice movement in the vicinity of a similar type of series of rifts on the Beardmore Glacier show that these do not form annually. Moreover surface features indicate that the first rift appears close to the line of floatation. It is suggested that these rifts occur when, in going afloat, the ice 'falls' over a submerged cliff. Some simple calculations are presented which support this view. The distance between consecutive rifts is predicted using experimental values of the strength of ice and is in good agreement with measurement. In this theory the distance is essentially independent of the speed of ice movement. (Knapp-USGS)

W69-06260

INVESTIGATIONS ON FISSION PRODUCTS IN THE ACCUMULATION AREA OF AN ALPINE GLACIER (KESSELWANDFERNER, OETZTAL ALPS),

Innsbruck Univ. (Austria). Dept. of Physics; and Alpine Forschungsstelle der Universitaet Innsbruck, Obergurgl (Austria).

W. Ambach, H. Eisner, and F. A. Prantl.
Comm. of Snow and Ice, Proc. Gen. Assembly of Bern (Sept-Oct 1967), Int. Ass. Sci. Hydrol., Pub No 79, pp 117-125, 1967. 9 p, 4 fig, 11 ref.

Descriptors: *Glaciers, *Radioactive dating, *Cesium, Flow rates, Gamma rays, Firn, Snow, Compaction, Snowpack, Ice, Movement, Alpine.

Identifiers: *Alps, Cesium radioisotopes, Gamma-ray spectrometry, Beta radiation measurement, Firn accumulation rate.

In the summer of 1964 six firn pits were dug at various altitudes in the accumulation area of the Kesselwandferner (Oetztal Alps, Austria) covering the annual layers of net accumulation from 1960/61 to 1963/64. The total beta-activity and the gamma-ray spectra of continuous sets of samples were measured. From the 0.66 MeV peak in the spectra the Cs-137 contribution to the fission product mixture was determined quantitatively. The results show that Cs-137 was essentially preserved within the annual layers of net accumulation from 1961/62 to 1963/64. Thus the late summer horizons of 1961 and 1964 present on the average characteristics changes in the Cs-137 activity profile, and can be used for dating purposes. The results of the total beta-activity measurements show, in addition, firn layers of relatively high total beta-activity between the late summer horizons of 1961 and 1964. In this case, a displacement of individual fission products stronger than that of Cs-137 is possible by meltwater percolation into deeper firn layers. Recent measurements of the vertical distribution of the total beta-activity show a significant decrease in firn layers above the late summer horizon of 1964. This may be also regarded as a criterion for dating purposes. (Knapp-USGS)

W69-06261

TRITIUM CONTENT IN THE FIRN LAYERS OF AN ALPINE GLACIER,

Innsbruck Univ. (Austria). Dept. of Physics; and International Atomic Energy Agency (Vienna). W. Ambach, H. Eisner, and L. L. Thatcher.

Comm. of Snow and Ice, Proc. Gen. Assembly of Bern (Sept-Oct 1967), Int. Ass. Sci. Hydrol., Pub No 79, pp 126-134, 1967. 9 p, 6 fig, 1 tab, 9 ref.

Descriptors: *Radioactive dating, *Tritium, *Glaciers, *Alpine, Firn, Fallout, Melting, Runoff, Streamflow, Movement, Ice, Tracers.
Identifiers: *Glacial meltwater tracers, Alpine glacier.

During the summer months of 1963 and 1964 firn samples for the determination of the tritium content were taken from the accumulation area of the Kesselwandferner (Oetztal Alps). In a 20 m deep vertical firn pit the annual net accumulation from

the years of between 1963 and 1951 were investigated. Samples from the annual layers between 1964 and 1960 were taken in 6 other pits at various locations on the Kesselwandferner in order to study the local variations in tritium content. The vertical distribution of tritium in the firn layers shows characteristic variations which can be attributed to thermonuclear bomb tests. Melt-water infiltration can cause considerable changes in tritium content. On an average, however, an identifiable boundary between tritium-containing tritium-lacking layers is maintained within the annual layer of net accumulation of 1961/62. In addition, ice samples taken from the ablation area were investigated which show no contamination by recent melt-water. The high tritium content of firn layers accumulated in recent years can be used for run-off studies. In this procedure the tritium deposited in younger firn layers can be used as a tracer for making the melt-water flow. (Knapp-USGS)
W69-06262

THE HEAT BUDGET OF A MELTING COVER OF SEA ICE, McGill Univ., Montreal (Quebec). Ice Research Project.

M. P. Langenberg.

Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 151-160, 1967. 10 p, 3 fig, 1 tab, 7 ref. Contract No CP-69-600000.

Descriptors: *Melting, *Sea ice, Energy budget, Solar radiation, Wind, Water temperature, Ablation, Evaporation, Arctic Ocean.
Identifiers: Sea ice melting, Ellesmere Island.

An investigation of the energy budget of a cover of sea ice was made in the late spring and early summer of 1965 at Tanquary Fiord, Ellesmere Island. Measurements in the first 2 metres above the surface, of wind speed and humidity were automatically recorded at 3 levels, as were more detailed temperature profiles through the thickness of the ice sheet. Solar radiation, incident on and reflected by the surface, was obtained on a continuous basis as was also the radiation balance. Daily observations were made on surface ablation, on the depth of melt water on the puddled surface, and of the total ice thickness. The salinity profile through the ice sheet was taken at weekly intervals. Energy balances were obtained for a pre-ablation period of 1 week during which the snow cover disintegrated but there was no apparent ablation of the ice, a pre-runoff period of 1 week during which the albedo decreased from about 0.6 to 0.2 and all the melt water remained on the surface, and the ablation period of 3 weeks during which draining of melt water through fissures in the ice was occurring and the surface assumed the characteristics puddled and hummocked appearance. The fluxes of sensible and latent heat were generally directed towards the ice sheet and provided less than 10% of the energy necessary to effect the observed ablation and change of heat content of the ice cover. The dominant factor during the melt season is the net radiation, which accounted for over 90% of the energy requirement. (Knapp-USGS)
W69-06263

EXPERIENCES IN COMPARING GEOMETRIC ELEMENTS OF GLACIER VARIATIONS, W. Kick.

Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 173-181, 1967. 9 p, 2 fig, 3 tab, 9 ref.

Descriptors: *Glaciers, *Regimen, *Regression analysis, Melting, Ablation, Statistical methods, Length, Height.
Identifiers: Glacial dimension variation, Standard deviations.

The significance of the variation of some single glaciers is calculated to test its validity for regional extrapolation. The confidence levels of the sample means were calculated for length variation (L) and

of level variation (h) measurements. The dispersion of the 18 L-data decreases and the confidence level of the mean increases if in a period of similar trend, longer periods of measurement are used. From the scatter of the h-values of 8 glaciers in the E. Alps it is deduced that 4-times more L-measurements than h-measurements would be necessary to ascertain the same confidence level of the mean. The h-data, taken solely from the equilibrium height zones, proved to be acceptable substitutes for the h-values of the whole glaciers, though they are generally a little smaller. For most of the time between 1920 and 1960 the h-values of the Aletschgletscher in Switzerland and of Tunsbergsdalsbreen in Norway range within the confidence interval of the h-mean of the 8 glaciers in the E. Alps. The altitude functions of h are compared. The dispersion of the h-values of corresponding height zones of 6 Nanga Parbat glaciers for the period of 1934-1958 has proved to be no larger than for the alpine glaciers. A diagram and 3 tables with variation data and their standard deviations are given. (Knapp-USGS)
W69-06264

CHANGE OF ITALIAN GLACIERS DURING THE DECADE 1957-1966 (FRENCH), Manfredo Vanni.

Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 182-192, 1967. 11 p, 3 fig, 4 tab, 2 ref. Article written in Italian.

Descriptors: *Glaciers, *Alpine, Ablation, Melting, Surveys, Snow surveys, Climatology, Temperature, Snowpacks, Cirques, Glaciation.
Identifiers: *Italian Alps, Glacial retreat, Mean summer temperature.

The Italian Glaciological Committee (CNR) undertook the first regular annual measurements of variations in Italian glaciers in 1925, the year which saw the beginning of an intense phase of retreat that was to continue for more than 40 years. The percentage of retreating glaciers reached maximums of 90 and 95% with a steady fall in the numbers of advancing, stationary and uncertain glaciers. The surface area of glacial cover in the Italian Alps fell during this 40-yr period by an average of more than 15% and thickness reduced by more than 40 m (1 m a year). For about 10 decades no factor suggested that this trend would reverse, but in the last decade statistics seem to suggest that it may now be doing so. An increase in the percentage of uncertain, snow-covered and stationary glaciers was seen in 1956 and, with some fluctuations, it has continued to the present. In 1960 to 1966, 42% of the glaciers were stationary with 50% in retreat. These results of direct measurement are supported by other observations including a fall in mean summer temperature, considerable snow-cover in the highest regions of the collection basins, persistence of extensive, thick patches of residual snow, particularly in those cirques and gullies where tiny glaciers used to be present before their gradual disappearance. (Knapp-USGS)
W69-06265

SALTS AND ASSOCIATED PHENOMENA OF THE TERMINI OF THE HOBBS AND TAYLOR GLACIERS, VICTORIA LAND, ANTARCTICA, Wisconsin Univ., Madison.

Robert F. Black, and Carl J. Bowser.
Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 226-238, 1967. 13 p, 11 fig, 22 ref.

Descriptors: *Salts, *Aqueous solutions, *Crystallization, Freezing, Sodium sulfate, Water quality, Antarctic, Ponds, Evaporation, Glacial drift, Halides, Thermal springs, Weathering.
Identifiers: *Victoria Land (Antarctica), Freeze concentration (Salts), Mirabilite, Aragonite, Ice-cored moraines, Moraines.

Mirabilite in disseminated crystals and relatively pure deposits is abundant in and on ice-cored moraine and under active ice at the terminus of Hobbs Glacier on the west side of McMurdo Sound. In 1966, 132 isolated deposits were located and described between sea level and nearly 200 m elevation. Stratification, texture, and sorting of the deposits and associated clastics and algae indicate they are pond deposits presumably concentrated by freezing and evaporation. Highly controlled deposits are conformable with fabrics in enclosing glacial ice, but others on top of the ice-cored moraine are undisturbed. The oldest deposits are in the basal shear moraine of the Hobbs Glacier; associated organic matter is radiocarbon dated at 12,000 years B. P. Other contorted deposits within the ice-cored moraine which has been derived from Koettlitz Glacier are dated by associated algae as 2,640 and 2,800 radiocarbon years B. P. The ultimate source of the salts is not known. (Knapp-USGS)
W69-06266

GLACIER MASS BUDGET AND MESOSCALE WEATHER IN THE AUSTRIAN ALPS 1964 TO 1966,

Innsbruck Univ. (Austria). Inst. of Meteorology and Geophysics.

Herfried C. Hoinkes, F. Howorka, and W. Schneider.

Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 241-254, 1967. 14 p, 4 fig, 8 tab, 9 ref. UNESCO contract NS/2803/65.

Descriptors: *Glaciers, *Alpine, *Regimen, *Climatology, Synoptic analysis, Ablation, Melting, Hydrologic budget, Weather, Precipitation (Atmospheric), Temperature, Snow, Firn.

Identifiers: *Glacial mass budget, *Austrian Alps, Mesoscale weather.

Mass budgets 1964-1966 of Hintereisferner and Kesselwandferner (Oetztal Alps, Tyrol), and of Stubacher Sonnbllick-Kees (Granatspitzgruppe, Salzburg) are compared with climatological data. Net ablation as function of time, the net budget gradient in the ablation area, and the retreat of the transient snowline were calculated with the aid of nomographs. These were constructed from daily observations at Vent (1900 m), using reduced cumulative temperatures and taking into account the retardation of ice melt by falls of fresh snow. The duration of the ablation period of 150 days in 1963/64 correspond to a strongly negative mass budget, whereas 64 days in 1964/65 were indicative of a highly positive mass budget. The mesoscale weather affecting glaciers is furthermore described by the frequency of selected weather types during the potential ablation season May to September. As a consequence of the more cyclonic character of the weather in the ablation season of 1965 temperatures at the 500 mbar level over the Alps were much lower. Characteristic deviations from the average height of the 500 mbar surface are used to correlate atmospheric circulation and glacier mass budget. (Knapp-USGS)
W69-06267

THE GREENLAND MASS BALANCE FLUX DIVERGENCE CONSIDERATIONS,

Cold Regions Research and Engineering Lab., Hanover, N. H.

Malcolm Mellor.

Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 275-281, 1967. 7 p, 2 tab, 10 ref.

Descriptors: *Glaciers, *Arctic, *Regimen, Hydrologic budget, Precipitation (Atmospheric), Ablation, Flow, Rheology, Strain, Strain measurement, Statistical methods, Mathematical models.
Identifiers: *Greenland, Flux divergence calculations, Glacial flow mechanics.

Fluctuations of glacier thickness with time are related to surface accumulation rate, principal flow

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Group 2C—Snow, Ice, and Frost

velocity, and principal flow and cross-slope strain rates by a partial differentiated flux divergence equation. Measured strain rates and other relevant data indicate a strong positive mass balance at 2 sites on the southern part of the Greenland ice cap and a possible weak negative balance in the northern part. A new analysis of published data indicates a negative balance in the central part of the ice cap. The flux divergence approach, although present results are inconclusive, holds considerable promise in mass balance investigations. With modern logistics, many sites can be investigated and flux divergence results can be validated on a statistical basis if errors are randomized. (Knapp-USGS)

W69-06268

MASS BALANCE OBSERVATIONS ON THE BARNES ICE CAP, BAFFIN ISLAND, CANADA, O. H. Loken, and R. B. Sagar.

Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol., Pub No 79, pp 282-291, 1967. 10 p, 4 fig, 4 tab, 8 ref.

Descriptors: *Glaciers, *Arctic, *Regimen, Data collections, Hydrologic budget, Snowpacks, Firn, Precipitation (Atmospheric), Ablation, Melting, Solar radiation, Climatology, Weather, Flow.

Identifiers: *Barnes ice cap, Baffin Island, Canada, Ice cap climatology.

Mass balance studies on the Barnes Ice Cap, Baffin Island, are described. The ice cap has an area of about 6,000 sq km. Its length is about 150 km and its width varies from 22-62 km. The maximum altitude is about 1,128 m, and the rim is about 500 m high. Ice altitude measurements are made on 199 stakes 1 km apart on 3 lines across the ice cap and along lines at the ends. Average snow depth is measured by sounding stick using 5-10 soundings at each stake. Density is determined at every 5th to 10th stake by Monte Rosa sampler. The southern part receives more winter accumulation than the northern part of the ice cap, but the difference varies from year to year. The winter balance on the top of the ice cap exceeds the winter season precipitation at nearby weather stations by an average factor of 3-4. The 1965-66 mean mass balance for the ice cap was -93 cm, a loss equal to 2-3 times the mean annual winter accumulation. The 1964-65 mass balance near the northern end was close to 0, and the equilibrium line there was at an altitude of about 800 m a. s. l. An east-west asymmetry of the mass balance exists across the crest of the ice cap; the northeast side has a more positive mass balance than the southwest side. Studies of moraine patterns around the ice cap indicates that this pattern has persisted for as much as five thousand years. (Knapp-USGS)

W69-06269

PLASTIC FLOW AND PRESSURE MELTING IN THE DEFORMATION OF ICE I,

Cambridge Univ. (England). Cavendish Lab. For primary bibliographic entry see Field 01A. W69-06270

2D. Evaporation and Transpiration

LOSS RATES ON SELECTED CATCHMENTS IN VICTORIA,

Water Research Foundation of Australia, Kingsford.

A. Karoly.

Water Res Found of Australia Bull No 13, 1965. 48 p, 22 fig, 10 tab, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Surface-groundwater relationships, *Rainfall disposition, Base flow, Infiltration, Runoff, Runoff coefficient, Storage coefficient, Small watersheds. Identifiers: *Australia, Loss rates (Rainfall-runoff relationships).

Storm rainfalls on 9 catchments in Victoria, Australia were analyzed for rainfall-runoff relation-

ships and 137 loss rates were derived. Loss rate is defined as the average rate of potential infiltration loss to surface runoff during the supply period of a storm. Relationships between loss rates and some hydraulic factors of the drainage basins were calculated. Frequency distributions and seasonal variations of loss rate were calculated and compared with U. S. and other Australian rates. (Knapp-USGS)

W69-06085

PRECISION MEASUREMENTS OF WATER DROPLET EVAPORATION RATES,

New Mexico Univ., Albuquerque. Dept. of Physics and Astronomy.

Pyung Syk Ro, T. S. Fahlen, and H. C. Bryant. Appl Opt, Vol 7, No 5, pp 883-890, May 1968. 8 p, 12 fig, 2 tab, 9 ref.

Descriptors: *Evaporation, *Raindrops, Measurement, Instrumentation, Research and development, Temperature, Optical properties, Light intensity. Identifiers: Glory effect (Meteorology), Lasers, Reflection, Interference (Optical), Interferometry.

The rate at which a motionless droplet evaporates can be measured continuously and precisely by determining the period of intensity fluctuation of laser light reflected off the center of the droplet. The back scattered light is the coherent sum of light reflected from the external and the internal surfaces of the droplet; under typical conditions the back scattered light intensity oscillates at about 2 Hz. This method is applied to pure water droplets in the diameter range from 0.6 mm to 1.8 mm, supported by bead thermistors and beaded glass fibers, and the results are compared with the quasi-stationary theory of Maxwell. Our measurements show that, after steady state is reached, the rate of change of diameter is inversely proportional to the diameter, as predicted in the quasi-stationary theory. Our experiments give a somewhat slower evaporation rate than the theory predicts; this discrepancy can be eliminated if one assumes that the surface temperature of the droplet is somewhat lower than measured with the bead thermistor. Using the optical method, mechanical resonances of the droplet can be sensitively detected; acoustically induced shape resonances are briefly investigated. (Knapp-USGS)

W69-06236

2E. Streamflow and Runoff

A PORTABLE RAINFALL SIMULATOR AND RUNOFF SAMPLER,

New Mexico State Univ., Las Cruces.

For primary bibliographic entry see Field 07B. W69-06011

THE MOON'S RESOURCES,

National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.

P. D. Lowman, Jr.

Sci J, Vol 5, No 5, pp 90-95, May 1969. 6 p, 3 photo, 2 tab, 4 ref.

Descriptors: *Resource development, *Resources, *Water resources, *Moon, Ice, Hydrates, Mining, Soils, Rocks. Identifiers: Natural resources (Lunar).

Materials available on the Moon are practical sources for many of the products needed to supply exploration parties. Soil and rock are, of course, very abundant and useful for construction. Water has not been detected but it is very likely to exist as ice just below the surface, or it may be produced from various hydrated minerals. From water, oxygen and hydrogen may be produced by using solar energy. Several gas emissions or volcanic eruptions have been observed on the Moon. Volcanic gases should be good sources of water, hydrogen, chlorides, sulfides, and carbon dioxide. Nothing is known about the presence or concentrations of ores on the Moon, but if the lunar crust is similar in

general composition to the Earth's crust, then it should be possible to extract most metals. (Knapp-USGS)

W69-06015

THE IUH (INSTANTANEOUS UNIT HYDROGRAPH) OF THE MUSKINGUM CHANNEL REACH,

City Univ., London (England). Dept. of Civil Engineering.

C. Venetis.

J Hydrol, Vol 7, No 4, pp 444-447, Apr 1969. 4 p, 2 fig, 3 ref.

Descriptors: *Routing, *Unit hydrographs, Streamflow forecasting, Runoff forecasting, Mathematical studies, Equations, Channel flow, Hydrograph analysis.

Identifiers: Muskingum routing, Instantaneous unit hydrograph.

The Muskingum method of flood routing involves the assumption of a linear transformation of the flood wave. The instantaneous unit hydrograph of the channel reach corresponding to the Muskingum equation is derived and shown to contain a negative impulse at the origin which explains the Muskingum prediction of negative outflow under certain conditions. The application of the convolution integral in the Muskingum flood routing method is briefly outlined. (Knapp-USGS)

W69-06020

NUMERICAL EXPERIMENTS WITH THE STANFORD WATERSHED MODEL ON SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,

Virginia Polytechnic Inst., Blacksburg. Dept. of Agricultural Engineering; and Agricultural Research Service, Blacksburg, Va. Soil and Water Conservation Research Div.

V. O. Shanholtz, and J. B. Burford.

Virginia Water Resources Res Center Rep, 1969. 15 p, 15 fig, 13 tab, 6 ref. OWRR Proj No A-018-VA.

Descriptors: *Mathematical models, *Computer models, *Rainfall-runoff relationships, *Virginia, Digital computers, Demonstration watersheds, Computer programs, Runoff forecasting, Streamflow forecasting, Routing, Water yield. Identifiers: Stanford Watershed Model.

A FORTRAN program of the Stanford Watershed Model was used to synthesize streamflow on 2 small agricultural watersheds, Brush and Crab Creeks, in Virginia. There were no statistically significant differences at the 15% level between synthesized and recorded mean monthly water yield for the watersheds. The estimates of maximum daily peak discharges on Brush Creek were significantly different from recorded values at the 1% level. Because snowmelt was not included in the model, some discrepancies occurred in calculated magnitudes and timing of peak discharges. Base flow tends to be consistently underestimated. Estimates of peak daily discharges were erratic but reasonably good, with major difficulties in summer when antecedent moisture was low. (Knapp-USGS)

W69-06032

THE VALLEYS OF IOWA-1: VALLEY WIDTH AND STREAM DISCHARGE RELATIONSHIPS IN THE MAJOR STREAMS,

Iowa Univ., Iowa City. Dept. of Geography.

Neil E. Salisbury, James C. Knox, and Richard A. Stephenson.

Iowa State Water Resources Res Inst Proj Completion Rep, Dec 31, 1968. 107 p, 42 fig, 4 tab, 49 ref. OWRR Project No A-006-IA.

Descriptors: *Geomorphology, *Drainage patterns (Geologic), *Iowa, *Streams, Terrain analysis, Topography, Discharge (Water), Streamflow, Floods, Glacial drift, Till, Pleistocene epoch, Drainage density.

Streamflow and Runoff—Group 2E

Identifiers: Valley width-stream discharge relationships.

The relationships between valley bottom widths and stream sizes in Iowa, particularly as shown by changes of width with downstream distance or with decline, are discussed in a general study of valley form and stream discharge. The variables studied were spatial variations in lithology, the influence of buried valleys, geologic structure, the influence of tributaries, the effects of meltwater, and the effects of various Pleistocene constructional landforms, particularly end moraines. The width-distance relationships is most useful in predicting runoff in stream basins with well integrated drainage patterns, and least useful where headwaters are on drift and the lower courses on well-integrated terrain. Constrictions in valley width are often associated with bedrock outcrops. Discharge records are tabulated for the 26 basins studied. The relationships between basins were studied by regression analysis. (Knapp-USGS)

W69-06034

WATER RESOURCES RESEARCH IN VIRGINIA,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.

William R. Walker.

Virginia Water Resources Res Center Bull 18, Sept 1968. 50 p, 4 parts, 1 append. OWRR Project No A-999-VA.

Descriptors: *Water resources, *Water resources research act, *Research facilities, *Projects, *Virginia, Research and development, Institutions, Water resources development, Grants, Colleges, Contracts.

Identifiers: *Water resources research, Project listing.

A detailed survey of active and current water resources research projects conducted by Universities, Government Agencies, and industries in Virginia is presented. The research projects are described by listing the agency performing the work, title of the project, principal investigators, project description, starting date, and cost. The mailing addresses of all project organizations are listed. (Knapp-USGS)

W69-06039

WATER RESOURCE RECORDS OF THE ECONFINA CREEK BASIN AREA, FLORIDA,
Geological Survey, Washington, D. C.
R. H. Musgrove, J. B. Foster, and L. G. Toler.
Florida Board of Conserv. Div Geol Inform Circ No 57, 1968. 127 p, 9 fig, 14 tab.

Descriptors: *Data collections, *Hydrologic data, *Water resources, *Florida, Surface waters, Groundwater, Water wells, Streamflow, Lake stages, Water levels, Water temperature, Water quality, Rainfall, Water yield, Aquifers, Logging (Recording).

Identifiers: Econfina Creek (Fla.).

Water resources data are compiled for the Econfina Creek basin, Florida. Tabulated data include streamflow, lake stages, chemical analyses of surface waters, water temperatures, chloride contents, rainfall, well locations, groundwater levels, pumping test data, well lithologic logs, well pumpage records, and groundwater chemical analyses. (Knapp-USGS)

W69-06051

FLOODS AT JACKSON, OHIO,
Geological Survey, Washington, D. C.
Earl E. Webber, and Ronald I. Mayo.

Geol Surv Hydrol Invest Atlas HA-325, 1968. 1 sheet, 3 fig, 1 map, 2 tab, 2 ref.

Descriptors: *Floods, *Stage-discharge relations, *Ohio, Hydrologic data, Data collections, Duration curves, Probability.

Identifiers: Atlas (Water data), Flood frequencies, Recurrence intervals, Flood profiles, Jackson (Ohio).

Hydrologic data are presented to be used to evaluate the extent, depth and frequency of flooding that may be expected along Little Salt Creek and its tributaries in the vicinity of Jackson, Ohio. The flooded area is shown on a topographic map scaled 1:12,000. Flood profiles, cross sections, and frequency curves show heights and probabilities of past and predicted floods. (Knapp-USGS)

W69-06056

FLOOD PLAIN INFORMATION, UPPER FLINT RIVER, MUD AND JESTER CREEKS, METROPOLITAN ATLANTA, GEORGIA.

Corps of Engineers, Mobile, Ala.

For primary bibliographic entry see Field 04A.

W69-06057

FLOOD PLAIN INFORMATION, CASEY CANAL NORTH, SAVANNAH AND CHATHAM COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.

For primary bibliographic entry see Field 04A.

W69-06058

FLOOD PLAIN INFORMATION, TAR RIVER AND STONY CREEK, ROCKY MOUNT, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.

For primary bibliographic entry see Field 04A.

W69-06059

FLOOD PLAIN INFORMATION, COBBS CREEK-FOWLER BRANCH, DEKALB COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.

For primary bibliographic entry see Field 04A.

W69-06060

FLOOD PLAIN INFORMATION, ROCK RIVER AT JANESEVILLE, WISCONSIN.

Corps of Engineers, Rock Island, Ill.

For primary bibliographic entry see Field 04A.

W69-06061

FLOOD PLAIN INFORMATION, BIG WALNUT CREEK, VICINITY OF COLUMBUS, OHIO.

Corps of Engineers, Huntington, W. Va.

For primary bibliographic entry see Field 04A.

W69-06062

FLOOD PLAIN INFORMATION, HUNNICKUTT CREEK, ATHENS, CLARKE COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.

For primary bibliographic entry see Field 04A.

W69-06063

FLOOD PLAIN INFORMATION, TAR RIVER AT LOUISBURG, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.

For primary bibliographic entry see Field 04A.

W69-06064

FLOOD PLAIN INFORMATION, DICKINSON BAYOU, DICKINSON, TEXAS.

Corps of Engineers, Galveston, Tex.

For primary bibliographic entry see Field 04A.

W69-06065

FLOOD PLAIN INFORMATION, ELLERBE, GOOSE, WARREN, SANDY AND THIRD FORK CREEKS, DURHAM, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.

For primary bibliographic entry see Field 04A.

W69-06066

FLOOD PLAIN INFORMATION, TURTLE CREEK, ROCK COUNTY, WISCONSIN.

Corps of Engineers, Rock Island, Ill.

For primary bibliographic entry see Field 04A.

W69-06067

FLOOD PLAIN INFORMATION, BEAVERDAM CREEK, PRINCE GEORGES COUNTY, MARYLAND.

Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 04A.

W69-06068

FLOOD PLAIN INFORMATION, OTTAWA RIVER, ALLEN COUNTY, OHIO.

Corps of Engineers, Detroit, Mich.

For primary bibliographic entry see Field 04A.

W69-06069

FLOOD PLAIN INFORMATION, OHIO RIVER, JEFFERSON COUNTY, KENTUCKY.

Corps of Engineers, Louisville, Ky.

For primary bibliographic entry see Field 04A.

W69-06070

THE HYDROLOGY OF THE LEXINGTON AND FAYETTE-COUNTY AREA, KENTUCKY.

Geological Survey, Louisville, Ky.

For primary bibliographic entry see Field 02F.

W69-06084

STAGE-DISCHARGE RELATIONS ON BIG LOST RIVER WITHIN NATIONAL REACTOR TESTING STATION, IDAHO.

Geological Survey, Idaho Falls, Idaho.

R. D. Lamke.

Prepared on behalf of the US Atomic Energy Comm. Geol Surv Open-file Rep IDO-22050, Mar 1969. 29 p, 30 fig, 7 ref.

Descriptors: *Stage-discharge relations, *Streamflow, *Idaho, Floods, Hydrologic data, Flow characteristics, Flow rates, Playas, Dikes, Flood control.

Identifiers: National Reactor Testing Station (Idaho), Big Lost River, Rating curves.

Theoretical stage-discharge relations were computed for 11 selected sites on the Big Lost River system within the National Reactor Testing Station and are shown graphically. These rating curves were computed by various techniques, which are dependent upon the hydraulic characteristics of each site. Relative accuracies of the rating curves are shown by presenting the curves of higher accuracy as solid lines and the curves of lower accuracy by dashed lines. The rating curves apply only for the conditions and for the physical and hydraulic characteristics existing in April 1968. After a large flood the curves could be considerably different because of erosion of the channels, dikes, and road embankments. Also, the curves for the culverts are for conditions of no debris at the entrances and in the barrels. Datum used in this report is mean sea level. (Knapp-USGS)

W69-06204

WATER RESOURCES IN THE GOOSE CREEK-ROCK CREEK BASINS, IDAHO, NEVADA AND UTAH.

Geological Survey, Boise, Idaho.

For primary bibliographic entry see Field 02F.

W69-06206

RESERVOIRS: PROBLEMS AND CONFLICTS,

For primary bibliographic entry see Field 06B.

W69-06207

SUMMARY OF MAXIMUM DISCHARGES IN UTAH STREAMS,

Geological Survey, Salt Lake City, Utah.

G. L. Whitaker.

Field 02—WATER CYCLE

Group 2E—Streamflow and Runoff

Utah State Dep Natur Resources Tech Publication No 21, 1969. 42 p, 13 fig, 4 tab, 7 ref.

Descriptors: *Data collections, *Hydrologic data, *Peak discharge, *Utah, Floods, Rainfall-runoff relationships, Runoff, Hydrographs, Stage-discharge relations, Streamflow.

Identifiers: Maximum stream discharges (Utah).

Maximum discharges determined at regular continuous-record stations, at crest-stage stations, and at miscellaneous sites in or near the borders of Utah through September 1967 are compiled in tables of this report. The data are presented separately for the Colorado River Basin and for the Great Basin and are summarized in graphs. Based on available data, figures representing the maximum floods of record are presented both in the graphs and in tabular form. (Knapp-USGS)
W69-06209

SURFACE DRAINAGE CHARACTERISTICS IN VOLUSIA COUNTY, FLORIDA,
Geological Survey, Ocala, Fla.
Darwin D. Knochenmus.
Florida Board of Conserv, Div of Geol Map Ser No 30, Dec 1968. 1 sheet, 5 fig, 1 tab, 2 ref.

Descriptors: *Drainage, *Hydrogeology, *Water table, *Florida, Water levels, Runoff, Surface-groundwater relationships, Drainage systems, Surface drainage, Subsurface drainage, Drainage wells, Aquifers, Groundwater.

Identifiers: Volusia County (Florida).

The surface drainage characteristics of Volusia County, Florida are shown by 4 maps describing drainage basins, rainfall, and runoff, piezometric surface, and feasibility of drainage projects. Hydrogeology has the greatest influence on the runoff distribution of the county. Because surface materials are permeable, rain infiltrates readily to the water table, 5-30 ft below the land surface. Many acres of low elevation are waterlogged and difficult to drain with surface canals because there the piezometric surface is higher than the land surface. (Knapp-USGS)
W69-06216

WATER IN BROWARD COUNTY, FLORIDA,
Geological Survey, Miami, Fla.
H. J. McCoy, and C. B. Sherwood.
Florida Board of Conserv, Div of Geol, Map Ser No 29, Nov 1968. 1 sheet, 9 fig, 7 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Florida, Water management (Applied), Canal seepage, Drains, Saline water intrusion, Water levels, Water table, Water wells, Water yield, Water sources, Water quality.

Identifiers: Broward County (Florida).

A general description of the water resources of Broward County, Florida is presented in a 1-sheet report consisting of text, graphs, and maps. Most water supplies in the county are obtained from the Biscayne aquifer which extends from the surface to over 200 ft deep and consists of sand and limestone. Wells in the thick limestone near the coast yield over 1,000 gpm. The water is hard and suitable for most uses. The effects of rainfall and pumpage on water levels are shown by well hydrographs. Stage-discharge relations of the drainage canals are shown graphically. The canals and the aquifers are hydraulically connected into an integrated flow system which is a physical basis for areal water management to assure long-term supplies of high-quality water. Saline water intrusion is shown by a contour map. (Knapp-USGS)
W69-06217

EFFECTS OF SMALL STRUCTURES ON WATER YIELD IN TEXAS,
Geological Survey, Austin, Tex.; and Texas Univ., Austin, Dept. of Civil Engineering.
For primary bibliographic entry see Field 03B.
W69-06218

FLOODS OF THE 1965 WATER YEAR IN MISSISSIPPI,

Geological Survey, Jackson, Miss.

Kenneth V. Wilson, and B. E. Ellison, Jr.

Miss State Board of Water Commissioners Bull 68-2, Sept 1968. 20 p, 4 fig, 1 tab, 1 ref.

Descriptors: *Floods, *Stage-discharge relations, *Mississippi, Surface waters, Streamflow, Hydrologic data, Data collections, Discharge measurement.

Identifiers: Mississippi floods (1965), Flood data.

The floods caused by 'Hurricane Hilda' in October 1964 were the greatest known in southern Mississippi. Unusual floods also occurred in various parts of the State during November and December 1964, and during February 1965. On October 3-4, 1964, as much as 12 1/2 in. of rain fell in the McComb-Brookhaven area in a 24-hr period. The rainfall was widespread, with at least 10 in. falling over an area of 1,300 sq mi, and at least 8 in. falling over an area of 4,000 sq mi. Record floods occurred on many streams draining areas between 10 and 750 sq mi. Bridge and road washouts occurred and agricultural losses were fairly high. As much as 10 in. of rain in a 24-hr period fell at Port Gibson on Nov. 27-28, 1964. The resulting floods were unusually high from small drainage areas between Port Gibson and Jackson, especially in the vicinity of Utica. Less significant floods on small streams occurred in southcentral Mississippi on Dec. 10-11, 1964, as a result of a 4-in. rainfall. Rainfall of 4 to 9 in. fell in northeastern and central Mississippi during the period Feb. 7-12, 1965, and caused unusual floods on the larger streams. Stages and discharges of the significant floods on major streams are tabulated. Frequency curves, hydrographs, and flood profiles are presented. (Knapp-USGS)
W69-06219

HYDROLOGICAL ASPECTS OF WATER MANAGEMENT,

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 06B.
W69-06221

SURFACE WATER HYDROLOGY (GENERAL OUTLINE),

Research Inst. for Water Resources Development, Budapest (Hungary).

L. Rakoczi, and K. Szesztay.

2nd Int Postgrad Course on Hydrol Method for Develop Water Resources Manage, Budapest, Hung, Jan-July 1968, Manual No 3, 1968. 108 p, 41 fig, 9 tab, 29 ref.

Descriptors: *Water management (Applied), *Water resources development, *Surface waters, Planning, Floods, Climatology, Hydrology, Runoff, Routing, Data collections, Networks, Hydrologic data, Water quality, Ice, Freezing, Erosion, Water temperature, Water balance, Hydrologic budget.

Identifiers: *Textbooks, Technical manuals, Lecture notes.

The requirements of water management agencies for surface water data and the methods of gathering information are outlined in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. The principles of organizing hydrological services involve establishing climatic and hydrologic data collection networks and experimental facilities. Examples are given of national networks already in operation and in the planning stages. The principles of surface water hydrology, including drainage basin morphology, runoff formation, floods, river morphology, erosion, stream water quality, ice, water balance, and thermal regime of standing waters, are discussed. (Knapp-USGS)
W69-06222

ESTIMATION OF SURFACE-WATER RESOURCES,

Research Inst. for Water Resources Development, Budapest (Hungary).

G. Kienitz, Gy Kovacs, M. Dobo, L. Rakoczi, and O. Starosolszky.

2nd Int Postgrad Course on Hydrol Methods for Develop Water Resources Manage, Budapest, Hung, Jan-July, 1968, Manual No 10, 1968. 221 p, 73 fig, 7 tab, 60 ref.

Descriptors: *Water resources, *Water requirements, *Water management (Applied), *Surface waters, Network design, Data collections, Streamflow forecasting, Hydrograph analysis, Water supply, Water demand, International waters, Water storage, Water allocation (Policy), Streamflow, Stream gages.

Identifiers: *Textbooks, *Technical manuals.

The determination of surface water resources and the social, legal, and economic aspects of international development of water resources are discussed in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. Inevitably, regional water resources management will involve intergovernmental planning and agreements. Already downstream uses of water are affected by upstream uses across national boundaries in many parts of the world. Methods are given to calculate regional water availability using stream and lake gaging networks. Estimation of regional demand for water is outlined. Management of streamflow for reliable water supplies, flood prevention, waste dilution, sediment control, and groundwater level maintenance is discussed. (Knapp-USGS)
W69-06229

HYDROLOGY OF WATER STORAGE,

Research Inst. for Water Resource Development, Budapest (Hungary).

B. Csermak, T. Krempels, K. Szesztay, I. V. Nagy, and K. Ubell.

2nd Int Postgrad Course on Hydrol Methods for Develop Water Resources Manage, Budapest, Hung, Jan-July 1968, Manual No 12, 1968. 193 p, 83 fig, 8 tab, 131 ref.

Descriptors: *Water management (Applied), *Reservoir operation, *Water yield, *Hydrology, Water resources, Runoff forecasting, Multiple-purpose reservoirs, Water utilization, Water demand, Water storage, Streamflow, Streamflow forecasting, Reservoir storage, River flow, Dams, River forecasting, Reservoir yield.

Identifiers: *Lecture notes, Reservoir management, Technical manuals, Textbooks.

The hydrological aspects of reservoir planning are discussed in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. The topics discussed include types of reservoir, basic hydrological data requirements, methods of yield estimation, dimensions of reservoirs for constant output, criteria for yield estimation, water demand estimation, multiple purpose reservoirs, problems of operation, and operating practices in Hungary and Japan. Site selection, investigation, and runoff zone protection are outlined. Underground storage is briefly discussed. (Knapp-USGS)
W69-06231

LONG-TERM TREND ANALYSES OF WATER QUALITY-A MODEL STUDY OF THE PASSAIC RIVER BASIN,

Rutgers - The State Univ., Newark, N. J. Dept. of Environmental Science; and Geological Survey, Trenton, N. J.

For primary bibliographic entry see Field 05B.
W69-06235

FLOOD PLAIN INFORMATION, RICHLAND COUNTY, SOUTH CAROLINA.
 Corps of Engineers, Charleston, S. C.
 For primary bibliographic entry see Field 04A.
 W69-06238

FLOOD PLAIN INFORMATION, GUADALUPE RIVER, SPRING CREEK AND LONE TREE CREEK, VICTORIA, TEXAS.
 Turner, Collie and Braden, Inc., Houston, Tex.
 For primary bibliographic entry see Field 04A.
 W69-06239

FLOOD PLAIN INFORMATION, SABINE RIVER AND ADAMS BAYOU, ORANGE, TEXAS AREA.
 Turner, Collie and Braden, Inc., Houston, Tex.
 For primary bibliographic entry see Field 04A.
 W69-06240

FLOOD PLAIN INFORMATION, DICKINSON, NORTH DAKOTA DRAINAGE DITCH.
 Corps of Engineers, Omaha, Neb.
 For primary bibliographic entry see Field 04A.
 W69-06241

FLOOD PLAIN INFORMATION, PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
 Corps of Engineers, Pittsburg, Pa.
 For primary bibliographic entry see Field 04A.
 W69-06242

FLOOD PLAIN INFORMATION, CUMBERLAND RIVER, ROARING RIVER, AND DOE CREEK, GAINESBORO, TENNESSEE.
 Corps of Engineers, Nashville, Tenn.
 For primary bibliographic entry see Field 04A.
 W69-06243

FLOOD PLAIN INFORMATION, SKOOKUMCHUCK RIVER, BUCODA, WASHINGTON.
 Corps of Engineers, Seattle, Wash.
 For primary bibliographic entry see Field 04A.
 W69-06244

FLOOD PLAIN INFORMATION, LAWSONS FORK CREEK AND FAIRFOREST CREEK, SPARTANBURG, SOUTH CAROLINA.
 Corps of Engineers, Charleston, S. C.
 For primary bibliographic entry see Field 04A.
 W69-06245

FLOOD PLAIN INFORMATION, SOUTH FORK OF FORKED DEER RIVER AND SUGAR CREEK, HENDERSON, TENNESSEE.
 Corps of Engineers, Memphis, Tenn.
 For primary bibliographic entry see Field 04A.
 W69-06246

FLOOD PLAIN INFORMATION, ARROYO DE LOS CHAMISOS AND ARROYO HONDO, SANTA FE, NEW MEXICO.
 Corps of Engineers, Albuquerque, N. Mex.
 For primary bibliographic entry see Field 04A.
 W69-06247

FLOOD PLAIN INFORMATION, CLARK FORK, MISSOULA, MONTANA.
 Corps of Engineers, Seattle, Wash.
 For primary bibliographic entry see Field 04A.
 W69-06248

WATER RESOURCES INVENTORY OF CONNECTICUT-PART 3, LOWER THAMES AND SOUTHEASTERN COASTAL RIVER BASINS,
 Geological Survey, Hartford, Conn.

For primary bibliographic entry see Field 02F.
 W69-06250

MEASUREMENT OF PEAK DISCHARGE BY INDIRECT METHODS,
 Geological Survey, Washington, D. C.
 M. A. Benson.
 World Meteorol Organ Tech Note No 90, 1968.
 161 p, 105 fig, 16 tab, 36 ref.

Descriptors: *Discharge (Water), *Discharge measurement, *Peak discharge, Stream gages, Channel flow, Spillway crests, Hydraulics, Stage-discharge relations, Weirs, Culverts.
 Identifiers: *Indirect discharge measurements, Slope-area method.

The discharge of streams is usually measured by the current-meter method. During flood periods, however, it is frequently impossible or impractical to measure the discharges by this method when they occur. Consequently, many peak discharges must be determined after the passage of the flood by indirect methods such as slope area, contracted opening, flow-over-dam, flow-through-culvert, rather than by direct current-meter measurement. Indirect methods of determining peak discharge are based on hydraulic equations which relate the discharge to the water-surface profile and the geometry of the channel. A field survey is made after the flood to determine the location and elevation of high-water marks and the characteristics of the channel. Detailed descriptions of the procedures used in collecting the field data and in computing the discharge are given for each of the methods. (Knapp- USGS)
 W69-06251

HYDROLOGICAL BENCH MARKS,
 Geological Survey, Washington, D. C.
 For primary bibliographic entry see Field 07A.
 W69-06252

QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES-1961,
 Geological Survey, Washington, D. C.
 For primary bibliographic entry see Field 03F.
 W69-06253

QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES-1960,
 Geological Survey, Washington, D. C.
 For primary bibliographic entry see Field 03F.
 W69-06254

TRITIUM CONTENT IN THE FIRN LAYERS OF AN ALPINE GLACIER,
 Innsbruck Univ. (Austria). Dept. of Physics; and International Atomic Energy Agency (Vienna).
 For primary bibliographic entry see Field 02C.
 W69-06262

2F. Groundwater

COASTAL EVIDENCES OF GROUND WATER CONDITIONS IN THE VICINITY OF ANAEHOOMALU AND LALAMILO, SOUTH KOHALA, HAWAII,
 Hawaii Univ., Honolulu. Water Resources Research Center.
 For primary bibliographic entry see Field 03B.
 W69-06006

THE MOON'S RESOURCES,
 National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
 For primary bibliographic entry see Field 02E.
 W69-06015

CONSTRUCTION OF PIEZOMETERS, AND METHOD OF INSTALLATION FOR GROUND WATER OBSERVATIONS IN AQUIFERS,
 Commonwealth Scientific and Industrial Research Organization, Merbein (Victoria). Div. of Horticultural Research.
 For primary bibliographic entry see Field 07B.
 W69-06019

GROUND-WATER RESOURCES OF MATAGORDA COUNTY, TEXAS,
 Texas Water Development Board, Austin.
 Weldon W. Hammond, Jr.
 Tex Water Develop Board, Rep No 91, Mar 1969.
 163 p, 35 fig, 12 tab, 55 ref.

Descriptors: *Groundwater, *Hydrologic data, *Water resources, *Texas, Aquifers, Water yield, Water wells, Water quality, Water levels, Hydrogeology, Water table, Water sources, Rainfall, Water-level fluctuations.
 Identifiers: *Matagorda County (Tex.).

Groundwater in Matagorda County, Texas, occurs in several formations of Cenozoic age with similar lithology. The formations are composed of interfingered beds and lenses of silt, clay, sand, and gravel, and function as a single water-bearing unit termed the Gulf Coast aquifer. Groundwater moves at 10 to 20 ft per yr from areas of recharge in and north of the county to areas of discharge in the Gulf of Mexico. Use of groundwater in the county has increased from 14 mgd in 1946 to 17 mgd in 1966. Of the 18,600 acre-feet or 17 mgd in 1966, 60% was for irrigation, 20% for industry, 12.5% for public supply, and 7.5% for rural domestic and livestock uses. Water levels in wells are gradually declining, especially in the western part of the county. However, the present pumpage of 18,600 acre-ft per yr (17 mgd) could be continued safely and economically indefinitely. Fresh groundwater containing less than 1,000 ppm dissolved solids is available in most of the county, while slightly saline water containing 1,000 to 3,000 ppm dissolved solids is available in all of the county. Groundwater suitable for irrigation is available in most of the county. On the basis of the transmission capability of the aquifer and upon development of a portion of the water in storage, about 118,000 acre-ft or over 6 times present pumpage could be pumped annually in Matagorda County for the next 100 yr. (Knapp-USGS)
 W69-06025

ANNUAL REPORT ON GROUND WATER IN ARIZONA, SPRING 1967 TO SPRING 1968.
 Geological Survey, Tucson, Ariz.

Ariz State Land Dep Water Resources Rep No 38, Feb 1969. 54 p, 32 fig, 1 tab.

Descriptors: *Groundwater, *Hydrologic data, *Data collections, *Water levels, *Arizona, Water-level fluctuations, Hydrogeology, Observation wells, Water yield.
 Identifiers: Arizona water levels (1967-68).

The groundwater conditions in Arizona, spring 1967 to spring 1968, are described by graphs showing water levels in selected wells, graphs showing estimated pumpage, and maps showing depth to water, change in water levels, and potential well production. In 1967 nearly 5.2 million acre-ft of water was withdrawn, and water levels declined in most of the State. Detailed descriptions of the groundwater situations are given for each physiographic province in the State. (Knapp-USGS)
 W69-06026

THE LOCATION OF DEEP AQUIFERS BY RESISTIVITY SOUNDINGS,
 MacQuarie Univ., Sydney (Australia). School of Earth Sciences; and Sydney Univ., (Australia). Dept. of Geology and Geophysics.
 R. J. Henderson, and D. W. Emerson.
 Australian J Sci, Vol 31, No 8, pp 299-300, Feb 1969. 2 p, 1 fig, 7 ref.

Field 02—WATER CYCLE

Group 2F—Groundwater

Descriptors: *Electrical studies, *Resistivity, *Geologic investigations, *Aquifers, Hydrogeology, Groundwater, Logging (Recording), Electrical well logging.

Identifiers: *Australia, Geophysical groundwater prospecting.

Field tests were made in Australia to study the feasibility of using earth resistivity methods to locate deep aquifers. Electric well logs were used to provide detailed information to check the results of the resistivity soundings made with the Schlumberger array with separations of up to 2 km. Theoretical sounding curves were constructed from geological data, and were very similar to the observed curves. It should be possible to locate an aquifer as deep as 500 m under conditions similar to those in the test area where a confined sandstone aquifer was overlain by alluvium and clay and underlain by volcanic and sedimentary rocks. (Knapp-USGS) W69-06027

HYDROGEOLOGIC DATA RELATED TO ESTABLISHMENT OF A PUMPING STATION IN THE EVERGLADES NATIONAL PARK, FLORIDA,

Geological Survey, Tallahassee, Fla.

Charles A. Appel, and Howard Klein.

Geol Surv open-file rep, 1969. 36 p, 5 fig, 1 tab, 3 ref.

Descriptors: *Water sources, *Groundwater, *Florida, National Parks, Aquifers, Transmissivity, Water yield, Water levels, Water control, Water distribution (Applied), Water supply.

Identifiers: *Everglades National Park, Water-collection galleries, Streamflow augmentation.

In order to alleviate the effects of prolonged drought on the plant and animal life in the northeastern part of the Everglades National Park, Florida, the National Park Service considered the possibility of pumping groundwater from a collection gallery to replenish deficient water in the Shark River Slough area. Design criteria called for a sustained yield of 100 cfs from a 4,000-ft gallery for as long as 100 days, with a resultant drawdown not to exceed 8 ft in the gallery. Results of tests along the northeastern boundary of the Park showed that the proposed gallery would yield only about 10% of the required rate. Results from an alternate site, from 10 to 14 mi to the south, indicated that a gallery there would have to be at least 20,000 ft long to yield 100 cfs. (Knapp-USGS) W69-06033

WATER RESOURCES RESEARCH IN VIRGINIA,

Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.

For primary bibliographic entry see Field 02E.

W69-06039

RECORDS OF OBSERVATION WELLS AND WATER-LEVEL FLUCTUATIONS IN THE ABERDEEN-SPRINGFIELD AREA, BINGHAM AND POWER COUNTIES, IDAHO, IN 1967,

Geological Survey, Boise, Idaho.

H. G. Sisco, and M. L. Griffiths.

Geol Surv Basic-Data mimeogr rep, Aug 1968. 27 p, 18 fig, 1 tab, 15 ref.

Descriptors: *Observation wells, *Water levels, *Water-level fluctuations, *Data collections, *Idaho, Water wells, Hydrographs, Reservoirs, Irrigation.

Identifiers: Periodic observations, Bingham County, Power County, Aberdeen-Springfield (Idaho).

Records of water-level fluctuations in observation wells in the Aberdeen-Springfield area, Bingham and Power Counties, Idaho, are tabulated. The observation well network consists of 21 wells west of the Snake River and east of the Aberdeen and High Line canals in an area irrigated with canal water, 4

wells south of the American Falls Reservoir in an area irrigated with surface water and groundwater, and 8 wells west of the canals in an area irrigated with groundwater. Monthly measurements of depth to water were made in 29 wells. In addition, 2 wells in Bingham County and 3 wells in Power County had recording gages. Information about location, type, depth, use, and altitude of the observation wells is tabulated. In addition to the tables of monthly observations of water levels for each well, hydrographs are used to show water level fluctuations. (Knapp-USGS) W69-06040

THE PIEZOMETRIC SURFACE OF THE COASTAL PLAIN AQUIFER IN GEORGIA, ESTIMATES OF ORIGINAL ELEVATION AND LONG-TERM DECLINE,

Georgia Univ., Athens.

Robert E. Carver.

Southeastern Geol, Vol 9, No 2, pp 87-99, June 1968. 13p, 3 fig, 1 tab, 26 ref.

Descriptors: *Potentiometric level, *Aquifers, *Drawdown, Georgia, Water level fluctuations, Groundwater, Water levels, Discharge (Water), Observation wells.

Identifiers: Coastal Plain Aquifer (Ga).

The principal source of underground water in the Coastal Plain of Georgia is an artesian aquifer consisting of Eocene to Miocene limestones capped by impervious Miocene sediments. The aquifer is heavily pumped and deep cones of depression in the piezometric surface developed around centers of population and industrial activity. Reports on artesian wells in Georgia published in 1898, 1908, and 1915 provided data which, after selection for reliability, were used to determine the original piezometric surface of the aquifer in an area extending from a line joining Augusta and Fort Gaines to the Atlantic Coast and Florida border. Comparison of the map of the original piezometric surface with a map of the piezometric surface in 1942 indicates significant changes in aquifer pressures between 1880 and 1942, notably a 40 ft decline in head in the area north of Tifton, Georgia. Comparison of the original piezometric surface map with recent data indicates that pressure declined approximately 35 ft in the area near the coast and 75 ft in the area north of Tifton between 1880 and 1966. The longterm effect of heavy pumping around major municipal and industrial centers on the Atlantic Coast is surprisingly far-reaching and suggests that a more extensive network of observation wells is needed to adequately monitor aquifer pressures. (Knapp-USGS) W69-06043

WATER RESOURCE RECORDS OF THE ECONFINA CREEK BASIN AREA, FLORIDA,

Geological Survey, Washington, D. C.

For primary bibliographic entry see Field 02E.

W69-06051

GROUND-WATER RESOURCES OF GREENVILLE COUNTY, SOUTH CAROLINA,

Geological Survey, Columbia, S. C., and South Carolina State Development Board.

Neil C. Koch.

SC State Develop Board Bull No 38, 1968. 47 p, 11 fig, 25 tab, 21 ref.

Descriptors: *Water resources, *Groundwater, Hydrologic data, *South Carolina, Water levels, Water yield, Water quality, Water wells, Hydrogeology, Aquifers, Water table, Water sources.

Identifiers: Greenville County (SC).

Groundwater in Greenville County, South Carolina, occurs in crystalline rock, saprolite, and overlying sediments. Yields up to 200 gpm are obtained from drilled wells in crystalline rock, and yields up to 5 gpm can be obtained from dug or bored wells in the saprolite or overlying sediments.

The best yields can be obtained from wells in crystalline rock located in valleys or draws; wells on slopes have slightly lower yields. Wells located on hills have yields 1/2 to 1/3 of those in valleys. The average yield of all drilled wells in Greenville County for which data are available is 17 gpm. Wells drilled in mica schist or granite gneiss have the highest average yields, about 38 gpm, whereas wells drilled in granite, gneiss-schist complex, biotite-hornblende gneiss, biotite gneiss, and mica-granite gneiss have average yields from 15 to 20 gpm. Geologic conditions to look for in selecting a well site are coarse textured rock, joints and fractures, quartz veins, and thick saprolite and overlying sediments. Most groundwaters are soft; 98% of 157 samples analyzed had a hardness of less than 60 ppm. The iron content of 61% of the samples ranged from 0 to 0.3 ppm. Water from the gneiss-schist complex had the highest iron content; 70% of the samples contained more than 0.3 ppm iron. Surface water is the largest source of supply in Greenville County. It is slightly acidic and low in dissolved solids. The dissolved solids content increases as the water moves downstream. (USGS) W69-06052

TEST WELL EXPLORATION IN THE MYAKKA RIVER BASIN AREA, FLORIDA,

Geological Survey, Tallahassee, Fla.

H. Sutcliffe, Jr., and B. F. Joyner.

Florida Div of Geol Inform Circ No 56, 1968. 61 p, 15 fig, 3 tab, 4 append.

Descriptors: *Data collections, *Hydrologic data, *Water wells, *Florida, Observation wells, Water levels, Logging (Recording), Water quality, Aquifers, Water sources, Water yield, Drill holes, Subsurface investigations.

Identifiers: Myakka River (Florida).

In recent years, difficulties encountered in obtaining groundwater supplies with acceptable chemical characteristics in the Myakka River basin area Florida led to the implementation of a test drilling program. Under this program, well drilling and data collection were executed in such a manner that all water-producing zones of the local aquifers, together with the quality and quantity of the water available, were effectively identified. A step-drilling method was utilized which allowed the collection of formation cuttings, water samples, and water-level data, from isolated zones in the well as drilling proceeded. The step drilling procedure is described. Hydrologic driller's logs, geophysical logs, and chemical quality of water tables are presented. (USGS) W69-06053

THE ROLE OF GROUNDWATER IN THE DEVELOPMENT OF WATER RESOURCES,

Water Planning for Israel Ltd., Tel Aviv. Research Dept.

For primary bibliographic entry see Field 04B.

W69-06054

UNDERGROUND STORAGE OF FLUIDS,

Michigan Univ., Ann Arbor. Dept of Chemical and Metallurgical Engineering, and Texas Univ., Austin. Dept. of Petroleum Engineering.

Donald L. Katz, and Keith H. Coats.

Ann Arbor, Mich, Ulrich's Books, Inc, 1968. 575 p, 228 fig, 43 tab, 167 ref, 15 append.

Descriptors: *Underground storage, *Liquids, *Gases, *Aquifers, *Reservoirs, Usable storage, Natural gas, Oil reservoirs, Borehole geophysics, Hydrogeology, Drill holes, Boreholes, Geologic formations, Hydraulics.

Identifiers: Underground fluid storage.

The underground storage of fluids is discussed in a comprehensive technical monograph written primarily for engineers, geologists, and managers working on the design, development, and operation of storage projects. The topics described in detail are geology of storage, sources of underground

geological data, rock properties, fluid properties, well drilling, geophysical well logging, well equipment, fluid flow, aquifer hydraulics, use of gas fields for storage, use of aquifers for storage, storage operation, control of underground gas movement, storage in salt cavities, storage in frozen ground, and liquified natural gas storage. The methods presented for engineering computations include computer programs for well tests and linear programming techniques for aquifer characteristics. Legal and governmental aspects of underground storage and the use of explosions, including nuclear explosions, to create cavities and zones of high permeability are discussed. (Knapp-USGS)

W69-06055

PRELIMINARY REPORT ON THE IRRIGATION POTENTIAL OF DUNN COUNTY, WISCONSIN,

Wisconsin Univ., Madison. Geological and Natural History Survey.

For primary bibliographic entry see Field 02G.

W69-06074

HYDROGEOLOGY AT SHELBYVILLE, ILLINOIS - A BASIS FOR WATER RESOURCES PLANNING,

Illinois State Geological Survey, Urbana.

Keros Cartwright, and Paul Kraatz.

Ill State Geol Surv Environ Geol Note No 15, June 1967. 15 p, 4 fig, 5 ref.

Descriptors: *Hydrogeology, *Aquifers, *Water wells, *Municipal water, *Illinois, Glacial drift, Sands, Gravels, Water yield, Discharge (Water).

Identifiers: Shelbyville (Ill.).

The city of Shelbyville, Illinois, obtains its public water supply from 2 sand and gravel aquifers that are contiguous at the site of the present municipal well field southwest of the city. To help the city make long-range plans for future water supplies, a hydrogeologic study of the aquifer system was made. The study outlines the present well field and areas for future water resource development. The potential yield of the well field was found to be more than 3 times the present pumpage. Several methods of water management would be physically feasible, and the physical conditions will allow the city considerable flexibility in planning future water facilities.

W69-06075

GEOLOGIC STUDIES AS AN AID TO GROUND-WATER MANAGEMENT,

Illinois State Geological Survey, Urbana.

For primary bibliographic entry see Field 04B.

W69-06082

THE HYDROLOGY OF THE LEXINGTON AND FAYETTE-COUNTY AREA, KENTUCKY,

Geological Survey, Louisville, Ky.

D. S. Mull.

Lexington and Fayette County Planning Comm Coop Rep, 1967. 24 p, 23 fig, 3 tab, 27 ref.

Descriptors: *Water resources, *Water management (Applied), *Hydrologic data, *Kentucky, Streamflow, Runoff, Aquifers, Groundwater movement, Water supply, Water utilization, Water levels, Recharge, Discharge (Water), Hydrographs, Duration curves, Floods, Waste disposal, Water pollution.

Identifiers: Lexington (Ky), Fayette River, Kentucky River, Recurrence intervals, Flood frequencies.

A study was made of the hydrology of Fayette County, Kentucky to provide information for use by the County Planning Commission and other planning agencies. The annual precipitation averages 43.71 in. or 582 mgd. About 60% is consumed by crops, natural vegetation, evaporation, and man. About 224 mgd leaves the county in

streamflow and 16 mgd in groundwater flow through cavernous limestones. During high streamflow, aquifers are recharged at a fairly high rate because of the abundance of joints and solution openings in the underlying limestones. Streamflow is summarized by duration curves for the Kentucky River and its major tributaries. Flood recurrence intervals are also shown graphically. Groundwater levels and flow directions are mapped. Chemical analysis data are tabulated for 9 streams, 29 wells, and 6 springs. Management problems include water pollution, future supply and demand, storm water disposal, and sewage treatment and disposal. (Knapp-USGS)

W69-06084

USE OF GRAVITY SHAFTS FOR GROUND WATER RECHARGE,

North Dakota State Univ., Fargo. Coll. of Civil Engineering.

For primary bibliographic entry see Field 04B.

W69-06202

WATER RESOURCES IN THE GOOSE CREEK-ROCK CREEK BASINS, IDAHO, NEVADA AND UTAH,

Geological Survey, Boise, Idaho.

E. G. Crosthwaite.

Idaho Dep of Reclam Water Inform Bull No 8, Feb 1969. 73 p, 25 fig, 6 tab, 28 ref.

Descriptors: *Water resources, *Groundwater, *Surfaces waters, *Idaho, Recharge, Water yield, Irrigation water, Water wells, Aquifers, Water sources, Water quality, Streamflow, Precipitation (Atmospheric).

Identifiers: Goose Creek-Rock Creek Area (Idaho).

In the Goose Creek-Rock Creek area of Idaho, Utah, and Nevada, 4 aquifers yield enough water for irrigation. The aquifers are Paleozoic limestone, Pliocene Idavada welded tuffs, ash flows, sands, and gravels, Pleistocene and Holocene Snake River basalts, and Pleistocene and Holocene alluvium. Estimated stream yield is 140,000 acre-ft per yr, all of which is used for irrigation. Total aquifer recharge is about 94,000 acre-ft per yr from rainfall and 345,000 acre-ft per yr from irrigation. Total recharge from all sources is about 400,000-500,000 acre-ft per yr. Of the total annual recharge, the Idavada Volcanics take 64,000 acre-ft, basalts take 330,000 acre-ft, and alluvium takes 45,000 acre-ft. About 430 wells pump 185,000 acre-ft per yr. Water levels are declining in areas where aquifers are thin and have low transmissibility, or pumpage is heavy. Most irrigation water has low salinity hazard. Some water from basalt and alluvium has medium to high salinity hazard. Stream water has medium salinity hazard. (Knapp-USGS)

W69-06206

GROUNDWATER LEVELS AND PUMPAGE IN THE PEORIA-PEKIN AREA; ILLINOIS, 1890-1966,

Illinois State Water Survey, Urbana.

Miguel A. Marino, and Richard J. Schicht.

Ill State Water Surv Rep of Invest 61, 1969. 29 p, 43 fig, 5 ref, append.

Descriptors: *Groundwater, *Water levels, *Illinois, Discharge (Water), Water yield, Water supply, Water-level fluctuations, Water wells, Hydrographs, Observation wells, Recharge, Potentiometric level.

Identifiers: Peoria (Ill), Pekin (Ill).

Groundwater resources in the Peoria-Pekin area are developed from sand and gravel aquifers. Water-level fluctuations in the aquifers, influenced by large groundwater withdrawals, are currently monitored in 14 observation wells. The Peoria-Pekin area is covered mostly with glacial drift, except in places where bedrock is exposed. In a large part of the area the glacial drift contains a thick deposit of Sankoty sand immediately above

bedrock. Conditions are favorable for development of large water supplies in the Sankoty sand and glacial outwash. Estimated pumpage from wells in the Peoria-Pekin area increased from about 1.5 mgd in 1870 to 80.6 mgd in 1944. The maximum rate of pumpage increase occurred from 1932 to 1933 when pumpage increased from 39.5 mgd to 60.3 mgd. Since 1944 pumpage has decreased erratically to approximately 65 mgd in 1966. Pumpage is concentrated in 5 major pumping centers: the Central Well Field, Sankoty Well Field, North Well Field, East Peoria, and Pekin South areas. Water-level declines, attributed to groundwater withdrawals in the Sankoty, the North, and the Central Well Field areas, have established hydraulic gradients from the Illinois River toward pumping centers. East of the Illinois River the groundwater surface contours show a steep gradient toward the river. In the immediate proximity of the river the average slope of the groundwater surface is about 30 ft per mile. (Knapp-USGS)

W69-06208

SELECTED HYDROLOGIC DATA, SOUTHERN UTAH AND GOSHEN VALLEYS, UTAH,

Geological Survey, Salt Lake City, Utah.

R. M. Cordova.

Utah Div of Water Rights Basic-Data Release No 16, 1969. 35 p, 2 fig, 1 plate, 10 tab.

Descriptors: *Data collections, *Hydrologic data, *Utah, Surface waters, Groundwater, Water quality, Water yield, Water wells, Springs, Streamflow, Water levels, Potentiometric level.

Identifiers: Southern Utah Valley, Goshen Valley (Utah).

Basic hydrological data are tabulated for Southern Utah and Goshen Valleys, Utah. The data include well and spring records, water levels, artesian pressures, drillers' logs, stream discharge records, and water chemical analyses. (Knapp-USGS)

W69-06211

GROUND-WATER LEVELS IN NEW MEXICO, 1967,

Geological Survey, Albuquerque, N. Mex.

F. E. Busch, and J. D. Hudson.

N Mex State Eng Basic Data Rep, 1969. 74 p, 30 fig, 36 tab, 41 ref.

Descriptors: *Data collection, *Hydrologic data, *Water levels, *Groundwater, *New Mexico, Observation wells, Water wells, Water-level fluctuations, Groundwater basins, Arid lands.

Identifiers: Periodic observations.

Annual measurements of water level in a network of about 1,500 observation wells in New Mexico are tabulated. The areas of groundwater observation were in 7 major surface-water drainage basins or groups of basins, most of which are in areas where groundwater is used in large quantities for irrigation, municipal, or industrial purposes. Maps and hydrographs are used to show water-level changes. Precipitation data are tabulated. (Knapp-USGS)

W69-06212

GROUND-WATER RESOURCES AND RELATED GEOLOGY OF NORTH-CENTRAL SPOKANE AND SOUTHEASTERN STEVENS COUNTIES, WASHINGTON,

Geological Survey, Washington, D. C.

Denzel R. Cline.

Wash State Dep Water Resources, Water Supply Bull No 17, 1969. 195 p, 10 fig, 2 plate, 11 tab, 27 ref, 1 append.

Descriptors: *Water resources, *Groundwater, *Washington, *Water yield, Discharge (Water), Water quality, Specific capacity, Aquifers, Hydrologic data, Water levels, Hydrogeology, Water table, Water sources, Quaternary period.

Identifiers: *Spokane (Wash).

Field 02—WATER CYCLE

Group 2F—Groundwater

Groundwater in the Spokane area, Washington, is found in aquifers in Quaternary loess, sand, alluvium and glacial drift deposits, Tertiary basalts and sands, and pre-Tertiary basement granites and metamorphic rocks. The basement rocks yield as much as 35 gpm to wells but some wells yield no water. The Tertiary rocks generally yield less than 35 gpm. The Quaternary rocks are several hundred ft thick in valleys and yield several thousand gpm with only a few ft of drawdown. Water levels are generally less than 100 ft below the land surface, but under mesas the deepest levels are below 500 ft. Recharge is probably about 1/5 of precipitation, or about 160,000 ac-ft/yr. In 1964, approximately 9 billion gal was pumped in the area, about 90% from unconsolidated deposits in the Spokane Metropolitan area. There has been no regional water-level decline. Most well water is hard and generally of good quality except where iron is excessive. (Knapp-USGS)

W69-06213

WATER IN BROWARD COUNTY, FLORIDA, Geological Survey, Miami, Fla. For primary bibliographic entry see Field 02E.

W69-06217

HYDROLOGICAL ASPECTS OF WATER MANAGEMENT,

Research Inst. for Water Resources Development,
Budapest (Hungary).
For primary bibliographic entry see Field 06B.
W69-06221

HYDROLOGY OF GROUNDWATER (GENERAL OUTLINE),

Research Inst. for Water Resources Development,
Budapest (Hungary).
K. Ubell.

2nd Int Postgrad Course on Hydrol Method for
Develop Water Resources Manage, Budapest,
Hung. Jan-July 1968, Manual No 4, 1968. 105 p.
46 fig, 2 tab, 44 ref.

Descriptors: *Hydrogeology, *Groundwater movement, Water yield, Permeability, Porosity, Transmissivity, Aquifers, Aquiclude, Water levels, Water level fluctuations, Water table, Springs, Water wells.

Identifiers: Groundwater hydrology, Textbooks, Technical manuals.

The principles of groundwater hydrology are outlined in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. Rocks are classified according to the nature, interconnection, and volume of interstices. The occurrence of groundwater, its management, and its natural discharge are discussed. Groundwater level fluctuations due to evaporation, pumping, wind, tides, earthquakes, streamflow, recharge, and runoff are described. Steady and unsteady saturated and unsaturated groundwater flow are characterized and equations are given for flow calculations. (Knapp-USGS)

W69-06223

ESTIMATION OF GROUNDWATER RESOURCES,

Research Inst. for Water Resources Development,
Budapest (Hungary).
M. Erdelyi, J. Galfi, G. Ollos, K. Ubell, and E.
Varrok.

2nd Int Postgrad Course on Hydrol Methods for
Develop Water Resources Manage, Budapest,
Hung. Jan-July 1968, Manual No 11, 1968. 273 p.
117 fig, 3 tab, 61 ref.

Descriptors: *Water resources, *Groundwater, Water yield, Groundwater movement, Hydrogeology, Electrical well logging, Seismic studies, Electrical studies, Geophysics, Model studies, Hydraulic models, Analog models, Computer models, Water management (Applied).

Identifiers: *Technical manuals, Hydrological exploration, Groundwater resource estimation, Technical manuals, Textbooks, Pumping tests, Well testing.

Techniques for conducting groundwater or hydrogeological investigations and evaluating groundwater resources are given in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. The methods of exploration discussed include surficial mapping, the use of air photos, earth resistivity surveys, thermal surveys, and electrical well logging. Hydrological investigation strategy is discussed for forested areas, uncovered areas, and sedimentary lowlands. Methods for the collection and evaluation of subsurface data are outlined. Equations and methods for the study of well hydraulics, steady flow, unsteady flow, aquifer leakage, pumping tests, drawdown analysis, image methods of well test analysis, the analysis of multiple well systems, and well development, are given. Groundwater theory is discussed and illustrated with solved problems. Model studies and modeling methods including analog models and computer models are described. The principles of estimating groundwater resources and safe yield used in the U.S., USSR, Germany, and Hungary are outlined. (Knapp-USGS)

W69-06230

ISOTOPE HYDROLOGY OF THE ARTESIAN AQUIFERS OF THE STYRIAN BASIN, AUSTRIA,

International Atomic Energy Agency, Vienna
(Austria). Section of Hydrology.
For primary bibliographic entry see Field 02K.
W69-06249

WATER RESOURCES INVENTORY OF CONNECTICUT-PART 3, LOWER THAMES AND SOUTHEASTERN COASTAL RIVER BASINS,

Geological Survey, Hartford, Conn.
Chester E. Thomas, Michael A. Cervione, Jr., and
I. G. Grossman.

Conn Water Resources Bull No 15, 1968. 105 p, 45
fig, 4 plate, 41 tab, 123 ref.

Descriptors: *Water Resources, *Surface waters, *Groundwater, *Connecticut, Streamflow, Runoff, Precipitation (Atmospheric), Water wells, Aquifers, Hydrologic data, Data collections, Water quality, Water levels, Water sources.

Identifiers: Lower Thames River basin (Connecticut).

The lower Thames and southeastern coastal river basins of Connecticut have a relatively abundant supply of water of generally good quality. Annual precipitation ranges from about 32 to 65 inches and averages about 48 inches. For the 30-yr period 1931 through 1960, the annual runoff from the report area averaged nearly 26 inches. A total annual average of 860 billion gal is available. Stratified drift is the only aquifer generally capable of yielding more than 100 gpm to individual wells. It covers about 20% of the area and occurs chiefly in lowlands where it overlies till and bedrock. The permeability of the coarse-grained stratified drift averages about 1,500 gpd per sq ft. Wells tapping this unit yield from 4 to 880 gpm and average 146 gpm. Fine-grained stratified drift has an average permeability of about 300 gpd per sq ft and can usually yield supplies sufficient for household use to dug wells. Bedrock and till are widespread but generally provide only small water supplies. Bedrock is tapped chiefly by drilled wells, about 90% of which will supply at least 3 gpm. The permeability of till ranges from about 0.2 gpd per sq ft to 120 gpd per sq ft. Long-term yields estimated for 18 areas of stratified drift especially favorable for development of large groundwater supplies ranged from 1.3 to 66 mgd. The chemical quality of water in the report area is generally good to excellent. Only 12% of the wells sampled yielded water with more than 200 ppm of dissolved solids and only 8% yielded water with more than 120 ppm of hardness. (Knapp-USGS)

W69-06250

HYDROLOGICAL BENCH MARKS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 07A.
W69-06252

2G. Water in Soils

NON-EQUILIBRIUM THERMODYNAMICS OF THE SOIL-WATER SYSTEM,

Agricultural Univ., Wageningen (Netherlands).
Lab. of Soils and Fertilizers.
P. H. Groenevelt, and G. H. Bolt.

J Hydrol, Vol 7, No 4, pp 358-388, Apr 1969. 31 p.
1 tab, 14 ref.

Descriptors: *Thermodynamics, *Soil water movement, Aqueous solutions, Energy transfer, Entropy, Enthalpy, Free energy, Mass transfer, Heat transfer, Temperature, Physicochemical properties, Soils, Porous media, Saline water systems, Osmosis.

Identifiers: *Non-equilibrium thermodynamics, Gradients.

The use of thermodynamics in studying the soil-water system is reviewed. A combination of the Gibbs equation of thermostatics, with appropriate conservation equations, is shown to yield an expression for the local production of entropy accompanying the flow of heat and mass. For viscous flow this local entropy production is not related unambiguously to the local rate of loss of pressure and potential energy, as part of the energy may be transferred to the environment in the form of viscous stress energy or stored as kinetic energy. The application of this equation to flow in porous media requires its integration over a finite volume as only surface averaged fluxes and potential differences over finite distances are accessible for experimental determination. In the process of integration the above energy transfer terms tend to disappear, yielding a straightforward expression for the entropy production, in terms of the 'macroscopic' gradients of the temperature and thermodynamic potentials. A regrouping of terms is shown to yield an alternative expression in terms of the fluxes of heat and soil solution, the diffusion fluxes of salts, and the electric current. For the single salt system the conjugated forces are then the gradients of the temperature, hydraulic head, osmotic pressure, and electric potential. The magnitude of transport coefficients in isothermal systems is calculated for an assumed model based on the presence of an electric double layer as the main cause of the selective action of the porous system on transport processes. (Knapp-USGS)

W69-06016

FACTORS RESTRICTING INFILTRATION RATES ON DECOMPOSED GRANITIC SOILS,

Nevada Univ., Reno, Coll. of Agriculture.
John T. Cory, and Robert J. Morris.

Water Resources Res Center Proj Rep No 11,

Desert Res Inst, pp 1-18, July 1968. 18 p, 2 fig, 5
tab, 13 ref. OWRR Project A-020-NEV.

Descriptors: *Organic soils, *Wettability, *Forest soils, *Forest fires, Permeability, Soil physical properties, Soil chemical properties, Wetting, Organic matter.

Identifiers: Non-wettable soils, Fired soils.

A preliminary report is given on the effects of physical and chemical relationships that influence the movement of water into granitic soils. The soil samples selected were obtained in brushland and pine covered areas representing both natural unburned and burned habitats. Organic material accumulated from forest litter decomposition or fungi activity restrict water flow in a 1/2 to 1 in. soil layer beneath the exposed soil surface. When fired, the organic layer appears to diffuse and/or distill downward to a depth of from 1 to 2 1/2 in. and increase in band width depending on the time and temperature of the exposure. As the organic matter

from fired soils causes a significant greater water repellency effect and a change in molecular composition it is postulated that the repellent layer formed under these conditions may represent a partially polymeric or silica-organic system. (Knapp-USGS)
W69-06041

INFILTROMETER STUDIES ON NON-WETTABLE SOILS ON EAST SIERRA NEVADA,
Nevada Univ., Reno, Coll. of Agriculture.
Syed B. Hussain, C. M. Skau, and R. O. Meeuwig.
Water Resources Res Center Proj Rep No 11, Desert Res Inst, pp 19-28, July 1968. 10 p, 1 tab, 9 ref. OWRR Project A-020-NEV.

Descriptors: *Organic soils, *Wettability, *Forest soils, Forest fires, Permeability, Soil physical properties, Soil chemical properties, Wetting, Organic matter.

Identifiers: Non-wettable soils, Fired soils.

Some forest soils on the eastern slopes of the Sierra Nevada near Mt. Rose are non-wettable, probably because of the presence of organic matter from pine litter. Infiltrometer plots, 30 1/2-by-20 in., were located in pure stands of pine, manzanita and tobaccobrush with 100% litter cover to test the differences in overland flow and sediment yield among the 3 cover types. Tests were also made on plots where mat-like pine litter was peeled off leaving bare soil. Results of these 'bared pine plots' were compared with those of bare soil plots in the open patches to differentiate the effect, if any, of pine litter on wettability of the underlying soil from its physical effects of restraining overland flow and sediment yield. Runoff-erosion measurements were made in another pine stand after an intense fire that consumed all litter. If litter is removed by fire, retention capacity of soil is not decreased as much as it would be if removal were effected by some other means. This may be due to the water-holding capacity of ash on burned plots. Fire appears to intensify non-wettability in soil as revealed by comparison of burned and burned-disturbed plots. Retention and sediment yield data are tabulated. (Knapp-USGS)
W69-06042

THE MEASUREMENT OF THE HYDRAULIC CONDUCTIVITY OF UNSATURATED POROUS MATERIALS UTILIZING A ZONE OF ENTRAPPED AIR,
Agricultural Research Service, Phoenix, Ariz.
Wat Conserv Lab.
K. K. Watson.
Soil Sci Soc Amer Proc, Vol 31, No 6, pp 716-720, Nov-Dec 1967. 5 p, 10 fig, 13 ref.

Descriptors: *Hydraulic conductivity, *Permeameters, *Soils, Unsaturated flow, Soil water movement, Permeability, Unsteady flow, Pore pressure, Wetting, Saturation, Soaking.

Identifiers: Air entrapment permeametry, Pore air pressure.

A steady-state method for determining the major portion of the hydraulic conductivity-water content relationship of reasonably coarse-grained unsaturated porous materials is presented. In the method, an initially saturated column of the material, in the process of draining to a water table at its base, is rewet at an appropriate time at its upper surface from a ponded supply. This occasions an increase in the pore air pressure in the zone of air entrapped in the profile between the wetting and draining fronts. Two physical consequences of this flow system, the formation of a bell-shaped water content profile and the rapid attainment of steady-state conditions, allow the determination of the conductivity-water content relationship. Precautions to be taken in using the method are outlined, and experimental details are discussed. Two sets of experimental results are documented. (Knapp-USGS)
W69-06071

SOIL-WATER PROPERTIES COMPUTED FROM TRANSIENT FLOW DATA,
California Univ., Riverside, Dept. of Soils and Plant Nutrition.
L. V. Weeks, and S. J. Richards.
Soil Sci Soc Amer Proc, Vol 31, No 6, pp 721-725, Nov-Dec 1967. 5 p, 2 fig, 6 tab, 6 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, *Permeameters, *Unsaturated flow, Soils, Permeability, Unsteady flow, Pore pressure, Wetting, Saturation, Soaking, Hydraulic gradient, Diffusion, Computer programs.

Identifiers: Transient flow permeameter.

A method is given for calculating water conductivity of unsaturated soil by measuring suction heads during transient changes of moisture content in a horizontal soil column. Absolute values of slopes of the soil moisture characteristic curve are used to calculate soil water diffusivity. The method requires neither difficult boundary condition computation nor equilibrium flow conditions. A FORTRAN IV program is available to reduce the data. Water conductivity values are independent of hydraulic gradients over a wide range of gradient values. Relative errors between measured and calculated diffusivity values were less than 50% in 74% of 288 measurements. Errors in water conductivity were less than 50% in 83% of 288 measurements. (Knapp-USGS)
W69-06072

PRELIMINARY REPORT ON THE IRRIGATION POTENTIAL OF DUNN COUNTY, WISCONSIN,
Wisconsin Univ., Madison, Geological and Natural History Survey.
Perry G. Olcott, Francis D. Hole, and G. F. Hanson.
Wis Univ Geol and Nat Hist Surv Spec Rep No 1, July 1967. 17 p, 6 fig, 4 tab.

Descriptors: *Irrigation, *Water supply, *Soils, *Wisconsin, Groundwater, Aquifers, Sandstones, Glacial drift, Water yield, Water quality, Drainage, Infiltration, Soil physical properties, Soil chemical properties, Irrigation water, Irrigation wells, Hydrogeology, Hydrologic data.

Identifiers: Dunn County (Wis), Irrigation potential.

The suitability of soils for irrigation and the availability of groundwater are used to assess the irrigation potential of Dunn County, Wisconsin. Wells of 500-1000 gpm probably can be developed in most parts of the county, which is underlain by the Galesville, Eau Claire, and Mt. Simon sandstones, with an aggregate thickness of 380-450 ft. About 1/3 of the county is covered with nearly level sands and loams which are largely irrigable. Feasibility of irrigation depends on the acreage that can be irrigated as a unit. Irrigation is not expected to have a significant effect on the groundwater reservoir until a large number of wells are operated, by which time it will be possible to calculate the best spacing of wells to minimize the effect of pumping on water levels. (Knapp-USGS)
W69-06074

SOIL PHYSICS,
Research Inst. for Water Resources Development, Budapest (Hungary).

A. Kezdi.
2nd Int Postgrad Course on Hydrol Methods for Develop Water Resources Manage, Budapest, Hung, Jan-July 1968, Manual No 5, 1968. 97 p, 56 fig, 2 tab.

Descriptors: *Soil physical properties, *Soil water movement, *Soil physics, *Soil mechanics, Mechanical properties, Mohr failure theory, Seepage, Soil dynamics, Soil pressure, Soil strength, Soil moisture, Soil stability, Soil compaction.

Identifiers: *Technical manuals, Textbooks.

The soil properties important in water resources studies are described in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. The soil properties that are important from a practical standpoint are permeability, compressibility, and shear strength. Soil stresses caused by seepage, unsaturated flow, and saturated flow are analyzed and methods given for their calculation. The application of the theory of elasticity to soil stress analysis is given. The principles of soil water movement are discussed and methods for its calculation are presented. Criteria for soil strength failure and methods of strength calculation are discussed. (Knapp-USGS)
W69-06224

2H. Lakes

ECOLOGICAL RELATIONSHIPS OF ORGANIC MATTER AND BACTERIA IN TUTTLE CREEK RESERVOIR,

Kansas State Univ., Manhattan.

John O. Harris.

Final Project Report-Kansas Water Resources Research Institute, July 1968. 11 p. OWRR Project A-012-KAN.

Descriptors: *Reservoir microbiology, *Flood microbiology, Water populations, *Reservoir pollution, Food chain, Productivity, Zooplankton, Self-purification, Energy sources.

A detailed study of the bacteria in water of Tuttle Creek Reservoir was conducted from March 1966 to March 1968. The bacterial population is generally low as compared with mid-Western rivers. The primary factor in determining the types and numbers of bacteria appears to be the impoundment of runoff and flood waters of the Big Blue river and its tributaries. Microorganisms present are predominantly soil types. Incomplete data indicate zooplankton feed extensively on the bacteria. Sewage type bacteria are normally absent from the reservoir during times between flood inflow. Self-purification is rapid. A technique consisting of incremental additions of various possible limiting nutrients, incubation, and characterization of the resulting populations was developed. Results indicate organic matter (available energy), nitrogenous materials, and phosphates all limit microbial growth in the reservoir. This short term study emphasizes the need for continued research on reservoir microbiology especially as it relates to the food chain and over-all water quality.
W69-06014

MOUNTAIN AND DESERT LAKES IN SOUTHERN KAZAKHSTAN, THEIR RESOURCES AND METHODS OF ECONOMIC DEVELOPMENT,

G. G. Muravlev.

Transl JPRS Rep No 45, 063, from Vestnik Akademii Nauk Kazakhskoy SSR, Alma-Ata, pp 38-45, Oct 1967. 8 p, 2 tab.

Descriptors: *Lake basins, *Water resources, *Developed waters, *Economics, Geography, Geology, Alluvium, Karst, Precipitation, Water supply, Water storage, Runoff, Groundwater, Vegetation, Aquatic life, Recreation facilities, Water level fluctuations, Exploitation, Irrigation, Saline lakes.

Identifiers: *Southern Kazakhstan, USSR.

By assuming that the small lakes of Kazakhstan can be conveniently regarded as peculiar geographic complexes and landscapes the Kazakhstan lakes were investigated on the basis of geological, geochemical, geographical, and hydrological data recorded by earlier investigators. The study shows that Kazakhstan has more than 6,500 lakes of about 1 sq km or more area, 21,000 lakes 0.3 km or more in length, and about 35,000 lakes covering an areas of 1 ha or more. More than 3,000 artificial reservoirs and ponds exist. In general the study shows that the lakes in the mountain regions differ

Field 02—WATER CYCLE

Group 2H—Lakes

considerably from those in the desert zone in the structure of the basins, in the processes that take place in them, and in the volume and development of their resources. The former lakes are fed by running fresh-water, whereas the lakes of the second type have little or no drainage and are mineralized in varying degrees. Rational and efficient utilization of these lake resources requires some transformation of the lakes by modifying the basin, water-salt balance, and composition of the organisms present in the lakes and shore areas. (Gabriel-USGS)

W69-06073

DENSITY FLOW REGIME OF FRANKLIN D. ROOSEVELT LAKE

Battle-Northwest, Richland, Wash. Dept. of Environmental Health and Engineering; and Bureau of Commercial Fisheries, Seattle, Wash. Fish Passage Research Program.

Robert T. Jaske, and George R. Snyder.

ASCE Proc, J Sanit Eng Div, Vol 93, No SA3, Psp 5272, pp 15-28, June 1967. 14 p, 11 fig, 9 ref, 1 append.

Descriptors: *Washington, *Reservoirs, *Thermal stratification, *Density currents, *Water circulation, Density stratification, Columbia River, Water temperature.

Identifiers: Lake Roosevelt (Wash.).

The thermal regime of Lake Roosevelt for the summers of 1964 and 1965, when compared with Yih and the Laboratory studies of Debler, shows good agreement regarding the position of the interfacial layer between the upper relatively stagnant zone and the region of primary flow transport. Further study of the temperature data and confirmation by a limited amount of current measurement shows the location of a second, lower interface roughly conforming to the upper boundary. During the season when stratification occurs, the resulting jet flow travels in a flat, undulating fashion, at times rising above the level of the discharge. Existing theory appears inadequate to fully predict this behavior, although an empirical relationship can be derived to perform engineering analysis. The study confirms the necessity to consider density currents in the management of special releases and in thermal and chemical material balances. Furthermore, the dynamic conditions within the reservoir distort the resulting flow jets to the extent that cooler masses can be by-passed. Another result is the blocking of the formation of 'normal' current jets, and, as a consequence, Lake Roosevelt fills with cool water by displacement from the north without any significant horizontal redistribution.

W69-06076

EUFULA RESERVOIR AERATION RESEARCH-1968

Robert S. Kerr Water Research Center, Ada, Okla. For primary bibliographic entry see Field 05G.

W69-06255

AGE AND GROWTH OF WHITE BASS IN ONEIDA LAKE, NEW YORK

Cornell Univ., Ithaca, N. Y. Dept. of Conservation.

For primary bibliographic entry see Field 05C.

W69-06275

BEHAVIOR OF HUMIC ACID IN RECENT LAKE SEDIMENTS TOWARD SODIUM HYDROXYDE AQUEOUS SOLUTION AT THE EXTRACTION (IN JAPANESE)

Akira Otsuki, and Takashisa Hanya.

Misc Rept Res Inst Nat Resources, Tokyo, No 69, pp 23-33, 1967. 15 fig, 5 tab, 12 ref. English summary.

Descriptors: *Humic acids, *Lakes, *Sediments, Carbon cycle, Chemical analysis, Chemical degradation, Diagenesis, Limnology, Organic compounds, Organic matter, Soil analysis, Soil chemistry, Temperature, Water chemistry.

Identifiers: *Extraction methods, *Hymatomelanic, *Lake Haruna (Japan), Infrared spectroscopy.

Consideration of the nature of organic matter in recent sediments is important from the point of view of the carbon cycle in lakes. The concept of soil humic substances was adapted to a study of organic matter in such sediments. They studied conditions of NaOH concentration and temperature for extraction of raw humic acid from recent sediments of Lake Haruna, Japan, and examined changes in their infrared spectra to determine alterations in humic acid and hymatomelanic acid (methanol soluble fraction). Spectra of humic acid obtained, under their conditions, showed no change, but those of hymatomelanic acid changed considerably, thus providing some evidence for the relationships between humic acid and hymatomelanic acid. (Eichhorn-Wis)

W69-06278

A BIOLOGICAL TEST FOR DETERMINING THE POTENTIAL PRODUCTIVITY OF WATER

Vermont Univ., Burlington. Dept. of Zoology.

For primary bibliographic entry see Field 05A.

W69-06279

RECOVERY OF ORGANICS FROM A EUTROPHIC LAKE BY THE CARBON ADSORPTION TECHNIQUE

Wisconsin Univ., Madison. Hydraulic Lab.; and Wisconsin Univ., Madison. Water Chemistry Lab.

For primary bibliographic entry see Field 05A.

W69-06282

MOVEMENT OF RADIOSODIUM IN A CHEMICALLY STRATIFIED LAKE

Wisconsin Univ., Madison. Dept. of Zoology.

Gene E. Likens, and Arthur D. Hasler.

Science, Vol 131, pp 1676-1677, June 1960. 1 fig, 4 ref.

Descriptors: *Radioecology, *Meromixis, *Lakes, Carbonates, Currents (Water), Density stratification, Diffusion, Limnology, Radioactive waste disposal, Seiches, Stratification, Sulfides, Water chemistry, Water circulation, Wisconsin.

Identifiers: *Radiosodium, *Experimental limnology, Anoxia, Bog lakes, Chemocline, Eddy diffusion, Mixolimnion, Monolimnion, Scintillation detection, Sodium-24, Stewart's Dark Lake (Wis), Temperate lakes.

Authors introduced radiosodium (Na-24) as an approximate point source at 8 meters depth in meromictic Stewart's Dark Lake, Wisconsin (area: approximately 2 acres; maximum depth: 8.8 meters; average depth: 4.3 meters; thermally and chemically stratified). They observed dispersal at various depths by submerging a scintillation detector along three transects of the lake. Radiosodium dispersed horizontally at an average rate of 18 meters/day. No appreciable vertical movement of radioactivity not attributable to density differences between the radioactive solution and the lake water at release was detectable. Authors suggest two possible hypotheses for the rapid movements observed: (1) physical transport as influenced by eddy diffusion, currents, and internal seiches; and (2) biological transport of the radionuclide within the lake. (Eichhorn-Wis)

W69-06283

SOURCES OF ELEMENTAL NITROGEN IN FERMENTATION GASES

Wisconsin Univ., Madison. Water Chemistry Lab.

For primary bibliographic entry see Field 05C.

W69-06285

2J. Erosion and Sedimentation

THORIUM AND URANIUM CONCENTRATIONS AND ISOTOPE RATIOS IN RIVER SEDIMENTS

Yale Univ., New Haven, Conn. Dept. of Geology.

Martha R. Scott.

Earth and Planetary Sci Lett, Vol 4, No 3, pp 245-252, May 1968. 8 p, 3 fig, 2 tab, 33 ref. Grant No AT (30-1) 2912-AEC.

Descriptors: *Sediments, *Organic matter, *Uranium radioisotopes, Clays, Alluvium, Sands, Particle size, Provenance, Streams, Water chemistry, Adsorption.

Identifiers: *Thorium, *Uranium, Complex ions.

Sediments from 5 rivers in the eastern and southern United States were divided into several size fractions and analyzed for thorium and uranium isotope concentrations. The U-238 decay series exhibits disequilibrium as a result of weathering. The U-234/U-238 activity ratio is less than unity in sediment derived from well-leached soils and greater than unity in sediment containing relatively large amounts of organic material from organic-rich surface layers of soil profiles. Th-230 exists in excess of equilibrium amounts relative to its parent U-234 in the fine fraction of most of the sediments analyzed. The thorium concentration and Th-230 excess are significantly higher in the 2-0.2 microns and less than 0.2 micron size fractions than in the 2-20 micron fractions, indicating adsorption by clays, complexing with sesquioxides, or possible concentration in reslates. Unsupported Th-230 is being added to deep-sea sediments at a maximum rate of 0.5 dpm/sq cm/1000 yr; therefore, detrital material is not a significant source of excess Th-230 in deep-sea sediments. (Knapp-USGS)

W69-06045

THE EFFECT OF LOOSE BLOCKS ON THE RATE OF SEDIMENT TRANSPORT

California Univ., Berkeley. Hydraulic Engineering Lab.

D. L. Aramayo.

Calif Univ. Water Resources Center Contrib No 118, Feb 1967. 39 p, 5 fig, 4 plate, 2 tab, 4 ref. WRC Proj No W118-IU-67.

Descriptors: *Sediment control, *Sediment transport, *Channel erosion, *Model studies, *Hydraulic models, Roughness (Hydraulic), Open channel flow, Sedimentation rates, Sediment discharge, Sediment load, Flow resistance, Turbulence, Fluid friction, Hydraulic design.

Identifiers: Sediment transport reduction.

In flume experiments on the effect of loose concrete blocks of various shapes and spacing on stream beds in reducing degradation, no definite conclusions were reached as to feasibility. When the blocks were very closely spaced they increased turbulence enough to prevent dune and ripple formation, and increased the rate of sediment transport by reducing bed form roughness. Optimum spacing of blocks is close enough to add bed roughness but distant enough to allow dune and ripple formation. This spacing is 15-20 diameters. Triangular pyramids were not stable on alluvial beds because of scour and undermining at their leading edges. Angle iron jacks followed the same spacing criteria as blocks; there was significant transport reduction at a spacing of over 15 diameters. (Knapp-USGS)

W69-06083

USE OF GRAVITY SHAFTS FOR GROUND WATER RECHARGE

North Dakota State Univ., Fargo. Coll. of Civil Engineering.

For primary bibliographic entry see Field 04B.

W69-06202

SEDIMENT TRANSPORTATION IN ALLUVIAL STREAMS,
Research Inst. for Water Resources Development,
Budapest (Hungary).

J. L. Bogardi.

2nd Int Postgrad Course on Hydrol Methods for
Develop Water Resources Manage, Budapest,
Hung, Jan-July 1968, Manual No 13 1968. 133 p.
35 fig, 40 ref.

Descriptors: *Sediment transport, Bed load, Suspended load, Water management (Applied), Sedimentation rates, Sediment load, Sedimentology, Sediment yield, Hydraulics, Particle shape, Particle size, Setting velocity, Sampling, Laboratory tests, Flumes, Hydraulic models, Mathematical models.

Identifiers: *Textbooks, *Technical manuals.

Sediment transport and sediment sampling are discussed in a technical manual presented as a chapter of a text written for an international post-graduate course in water resources management. Both empirical and theoretical descriptions of sediment movement are examined in detail. Hydraulic and mathematical model studies of bed load and suspended load movement are described and evaluated. The basic theories of the relationship of stream hydraulic regime to sediment movement are reviewed and discussed with examples taken from field and laboratory studies. Recent work in the US, USSR, and Hungary is reviewed. (Knapp-USGS)

W69-06232

KANSAS RIVER, BONNER SPRINGS TO MOUTH, DEGRADATION OF CHANNEL,
Geological Survey, Lawrence, Kans.
L. W. Furness, C. D. Albert and R. B. Leonard.
Geol Surv open-file rep, Feb 1967. 18 p, 5 fig, 2 plate, 1 tab.

Descriptors: *Degradation (Stream), *Stream erosion, *Kansas, Rivers, Sediment yield, Sands, Sand pits, Sediment transport, Construction materials.
Identifiers: *Kansas River (Kans).

The stage of low discharges in the Kansas River between Bonner Springs and Turner Bridge degraded an average of 2.6 ft from 1952-1965 ft. Degradation could be caused by increased regulation upstream, change in channel capacity, change in slope, change in sediment load, or removal of sand. Investigation of these factors showed that only sand removal is significant. The quantity of sand mined would have degraded the river 13.2 ft between 1939 and 1965 without upstream sediment supply, and actually resulted in 2.6 ft of net degradation. (Knapp-USGS)

W69-06256

EROSIVE PROCESSES WHICH ARE LIKELY TO ACCENTUATE OR REDUCE THE BOTTOM RELIEF OF VALLEY GLACIERS,
Hans Rothlisberger.

Comm of Snow and Ice, Proc Gen Assembly of Bern (Sept-Oct 1967), Int Ass Sci Hydrol, Pub No 79, pp 87-97, 1967. 11 p, 3 fig, 1 tab, 12 ref.

Descriptors: *Glaciers, *Erosion, Movement, Rheology, Friction, Ice, Mechanical properties, Shear stress, Shear drag.
Identifiers: Glacial chipping, Subglacial stream erosion.

Glacial erosion, particularly by particles in the base of the ice, is discussed. Inclusions collected at the bergschlund come into contact with the bed downstream, but additional fragments move downward through the ice from surface sources. Some processes involved in the downward movement of particles are bottom melting by geothermal heat, bottom melting by friction, melting by friction of flowing water, melting by heat transported in water, rotation of inclusions, and changing of ice thickness by extension or compression. Glacial valleys are commonly too large to have been produced

exclusively by abrasion by surface-supplied particles. Other processes of erosion operating in glaciers are subglacial stream erosion and glacial chipping of bed material. Any chipped particles also become abrasive tools, greatly increasing the erosive effect of the chipping. (Knapp-USGS)

W69-06259

SALTS AND ASSOCIATED PHENOMENA OF THE TERMINI OF THE HOBBS AND TAYLOR GLACIERS, VICTORIA LAND, ANTARCTICA,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 02C.
W69-06266

2K. Chemical Processes

CARBONATE SCALE IN ROMAN AND MODERN CANALS IN THE JORDAN VALLEY,
Food and Agriculture Organization of the United Nations, Iraklion (Crete).
For primary bibliographic entry see Field 08A.
W69-06017

AN EVALUATION OF SOME METHODS FOR THE DETERMINATION OF FLUORIDE IN POTABLE WATERS AND OTHER AQUEOUS SOLUTIONS,
Ministry of Technology, London (England). Lab. of Government Chemist.
For primary bibliographic entry see Field 05F.
W69-06037

DEAD SEA BRINES: DEGREE OF HALITE SATURATION BY ELECTRODE MEASUREMENTS,
Weizmann Inst. of Science, Rehovoth (Israel).
Abraham Lerman, and Adam Shatky.
Earth and Planetary Sci Lett, Vol 5, No 2, pp 63-66, Oct 1968. 4 p, 1 fig, 1 tab, 12 ref.

Descriptors: *Brines, *Saturation, *Salinity, Water chemistry, Evaporation, Lakes, Arid lands, Salts, Halides, Chlorides, Sodium chloride, Chemical potential.
Identifiers: *Dead Sea (Israel), Ion activity product measurements.

Ion activity product measurements in the Dead Sea show undersaturation with respect to halite in the upper 40 m and very uniform near-saturation conditions below 100 m. The layer from 40-100 m has very strong saturation gradients. Calculated ionic activity products show a similar pattern, but the calculated values are everywhere higher than measured values by 15-20%. (Knapp-USGS)

W69-06038

OXYGEN ISOTOPIC COMPOSITION OF SULFATE IONS IN WATER FROM THERMAL SPRINGS,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Laboratorio di Geologia Nucleare.
A. Longinelli.

Earth and Planetary Sci Lett, Vol 4, No 3, pp 206-210, May 1968. 5 p, 2 fig, 2 tab, 17 ref. C.N.R.-C.N.E.N. No. 115/1159/1472.

Descriptors: *Thermal springs, *Water sources, *Sulfates, Oxygen, Groundwater, Water chemistry, Spring waters.
Identifiers: *Oxygen isotopes, *Isotope fractionation.

No variation of the distribution of oxygen-18 between sulfate and water with temperature was found in water from 34 thermal springs in Tuscany (Italy). Oxygen isotope determinations made on Triassic and Miocene evaporites in the area show that the Upper Triassic evaporites are the source of the sulfate discharged in the spring waters. (Knapp-USGS)

W69-06044

THORIUM AND URANIUM CONCENTRATIONS AND ISOTOPE RATIOS IN RIVER SEDIMENTS,
Yale Univ., New Haven, Conn. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W69-06045

ISOTOPE HYDROLOGY OF THE ARTESIAN AQUIFERS OF THE STYRIAN BASIN, AUSTRIA,
International Atomic Energy Agency, Vienna (Austria). Section of Hydrology.

G. H. Davis, G. L. Meyer and C. K. Yen.
Steirische Beitrage zur Hydrogeologie, pp 51-62, 1968. 12 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Groundwater movement, *Tracers, *Radioisotopes, *Stable isotopes, Carbon radioisotopes, Tritium, Radioactive dating, Radiochemical analysis, Tracking techniques, Groundwater basins, Aquifers, Artesian wells, Hydrogeology.
Identifiers: *Austria, Styrian Basin.

Waters of the artesian aquifers of the Styrian Basin, Austria, were analyzed for radioactive and stable isotopes of hydrogen, oxygen, and carbon to characterize the waters of the separate aquifer systems, to determine the circulation of the systems, and to attempt to calculate velocity of groundwater flow. Reconnaissance sampling showed strong variation in deuterium and oxygen-18, suggesting that these isotopes might be useful in characterizing the waters. Carbon-14 and stable isotope data suggest that differences in stable isotope content are related to time since recharge, and reflect Pleistocene to Recent climatic changes. The low tritium content and the apparent carbon-14 ages suggest little groundwater circulation and there is little vertical variation in the waters. (Knapp-USGS)

W69-06249

QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES-1961,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 03F.
W69-06253

QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES-1960,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 03F.
W69-06254

HYDROLYSIS OF CONDENSED PHOSPHATES-I: NON-STERILE ENVIRONMENT,
Wisconsin Univ., Madison. Water Chemistry Lab. Nicholas L. Clesceri, and G. Fred Lee.
Int J Air Water Pollution, Vol 9, pp 723-742, 1965. 6 fig, 3 tab, 44 ref.

Descriptors: *Environmental effects, *Hydrolysis, *Phosphates, Chemical degradation, Chemical reactions, Chlorella, Detergents, Enzymes, Eutrophication, Hydrogen ion concentration, Kinetics, Lakes, Phosphorus compounds, Temperature, Water chemistry, Water pollution control, Water pollution effects, Water pollution sources, Wisconsin.

Identifiers: *Non-sterile environment, *Condensed phosphates, Algal growth, Allen's medium, Gorham's medium, Chemical kinetics, Colloidal gels, Complexing cations, Chlorella pyrenoidosa, Culture media, Ionic environment, Lake Mendota (Wis), Pyrophosphate, Tripolyphosphate.

The kinetics of hydrolysis of pyrophosphate and tripolyphosphate in sterile and non-sterile lake water and algal culture media have been investigated. The chemical hydrolysis of these compounds is a relatively slow process, while biochemical hydrolysis is rapid. The relative stability of these compounds is dependent upon environmental factors, especially the presence of microorganisms. (Lee-Wis)

W69-06271

Field 02—WATER CYCLE

Group 2K—Chemical Processes

TOWARDS STANDARDIZATION OF SOIL EXTRACTS FOR MICROBIAL MEDIA,
Wisconsin Univ., Madison. Dept. of Soils.
R. F. Harris, and D. R. Keeney.
Can J Microbiol, Vol 14, pp 653-659, 1968. 2 fig, 2 tab, 15 ref.

Descriptors: *Soil microbiology, *Standards, *Freeze drying, Microbiology, Nutrient requirements, Nutrients, Organic compounds, Organic matter, Soil analysis, Soil chemistry, Soil microorganisms, Soils, Sediment.
Identifiers: *Microbiological media, *Soil extracts, Microbial nutrition, Organic carbon.

The effect was evaluated of soil:water ratio and autoclaving time on efficiency of organic carbon extraction from soil and developed a method for routine preparation of freeze-dried soil extracts of standardized carbon content. Optimum soil:water (weight/volume) ratio chosen for soil extract preparation depends on water-holding properties of soils and on subsequent use of extract. A ratio of 1:3 to 1:5 appears optimum for preparation of freeze-dried extracts. Efficiency of carbon recovery decreases drastically at ratios less than 1:2 to 1:3. Longer autoclaving times will yield substantial increases in organic carbon, with most marked increases occurring during first hour. No major differences were noted in numbers of soil microorganisms developing on agar media prepared from diverse extracts so long as pH (6.0-7.5) and carbon content (0.1-2.6 grams/liter) of extracts were within normal range for soil extracts used for microbial media. (Keeney-Wis)
W69-06272

HYDROLYSIS OF CONDENSED PHOSPHATES-II: STERILE ENVIRONMENT,
Wisconsin Univ., Madison. Water Chemistry Lab.
Nicholas L. Clesceri, and G. Fred Lee.
Int J Air Water Pollution, Vol 9, pp 743-751, 1965.
2 fig, 9 tab, 11 ref.

Descriptors: *Environmental effects, *Hydrolysis, *Phosphates, Calcium, Chemical degradation, Chemical reactions, Detergents, Digital computers, Eutrophication, Hydrogen ion concentration, Kinetics, Lakes, Phosphorus compounds, Temperature, Water chemistry, Water pollution control, Wisconsin, Water pollution effects, Water pollution sources.

Identifiers: *Sterile environment, *Condensed phosphates, Rate constants, Allen's medium, Culture media, Lake Mendota (Wis), Pyrophosphate, Tripolyphosphate, IBM 1620, Gorham's medium.

The kinetics of hydrolysis of pyrophosphate and tripolyphosphate in sterile lake water and algal culture media have been investigated. The rate of hydrolysis in sterile Lake Mendota, Wisconsin, water is approximately 1000 times faster than in distilled water. First order rate constants for the hydrolysis of pyrophosphate and tripolyphosphate in sterile Lake Mendota water at 25 deg Celsius and pH 8.3 are 0.0000061/minute and 0.000014/minute, respectively. The rates of hydrolysis in sterile lake water and algal culture media appear to be accelerated by calcium. (Lee-Wis)
W69-06284

SOURCES OF ELEMENTAL NITROGEN IN FERMENTATION GASES,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 05C.
W69-06285

2L. Estuaries

LONGITUDINAL ESTUARINE DIFFUSION IN SAN FRANCISCO BAY, CALIFORNIA,
Oregon State Univ., Corvallis; and California Univ., Berkeley.
For primary bibliographic entry see Field 05A.
W69-06030

SOLUTION OF ESTUARY PROBLEMS AND NETWORK PROGRAMS,
Rice Univ., Houston. Dept. of Environmental Science and Engineering; and Texas Univ., Austin. Dept. of Civil Engineering.
J. V. Leeds, and H. H. Bybee.
ASCE Proc, J Sanit Eng Div, Vo. 93, No SA3, Pap 5277, pp 29-36, June 1967. 8 p, 5 fig, 7 ref, 1 append. Grant FR-254-01 (NIH), Grant 2T-WP-44-04 (PHS).

Descriptors: *Estuaries, *Path of pollutants, *Water circulation, *Computer programs, Digital computers, Data processing, Hydrologic data, Dispersion, Networks, Electrical networks.
Identifiers: Electrical network computer programs.

Computer programs originally written to solve electrical network problems can be used to solve estuary pollution problems. These are simple to use and efficient in calculating the frequency response of the estuary. Furthermore, sensitivities of the solution to parameter changes can be readily calculated using a method developed for electrical networks. The sensitivities are then used to indicate required measurement accuracy of the fundamental coefficients of the mathematical model. (Knapp-USGS)
W69-06077

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE FEASIBILITY OF DEEP-WELL INJECTION OF WASTE BRINE FROM INLAND DESALTING PLANTS,
Oak Ridge National Laboratory, Tenn.
For primary bibliographic entry see Field 05E.
W69-06286

ENVIRONMENTAL IMPACT OF BRINE EF-FLUENTS ON GULF OF CALIFORNIA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 05C.
W69-06287

SECONDARY REFRIGERANT FREEZING DESALTING PROCESS: OPERATION OF A 15,000 GPD PILOT PLANT,
Struthers Scientific and International Corp., New York.

N. Ganiaris, J. Lambiris, and R. Glasser.
Office of Saline Water, Research and Development Progress Report No. 416, March 1969. 95 p. OSW-14-01-0001-734.

Descriptors: *Desalination Processes, *Freezing, Pilot plant, Crystallization.

Identifiers: *Secondary refrigerant freezing, Bu-tane process, Freezer, Washer, Melter.

The development of the secondary refrigerant freezing process in a 15,000 gpd pilot plant is described. The results of the experimental program demonstrated that the process was technically feasible at the 15,000 gpd pilot plant level. Product water with less than 500 ppm T.D.S. and less than 0.20 ppm of dissolved hydrocarbon was produced on a continuous basis. Sparging hydrocarbon refrigerant (butane) into precooled sea water resulted in the production of ice crystals greater than 1.0 mm diameter; higher volumetric ice production rates, and lower entrainment of butane in the ice slurry. Washing the ice countercurrently according to the hydraulic piston-bed displacement method resulted in the production of potable water. Wash column rates of about 2100 GPD/ft² were achieved in the pilot plant wash column. On the basis of pilot plant performance, the cost of water, for plants with capacities of 1.0 to 10 million GPD is in the range of \$1.00 to 0.45 per 1000 gallons. (Rinne-Office of Saline Water)
W69-06288

3B. Water Yield Improvement

COASTAL EVIDENCES OF GROUND WATER CONDITIONS IN THE VICINITY OF ANAEHOOMALU AND LALAMIO, SOUTH KOHALA, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.

Doak C. Cox, Frank L. Peterson, William M. Adams, Chester Lao, and John F. Campbell.
Technical Report No 24, March 1969, 53 p. 6 tab, 14 fig, 10 ref.

Descriptors: *Basalt, *Salinity, *Coastal springs, *Ground-water flux, *Electrical resistivity, *Gravity, *Electrical profiling, *Electrical sounding, *Microgravity, *Hawaii, *Lava flow, *Coastal spring.

Ground-water flux through the Anaehoomalu and Lalamilio districts is thought to be quite low, owing to the small recharge which results from the generally low rainfall and the high evapotranspiration. Computations of recharge from annual rainfall and losses from evapotranspiration suggest that the discharge along the shoreline averages only a few million gallons per day per mile. Onshore reconnaissance, which included sampling of wells and water holes, and electrical resistivity and gravity surveys, and an offshore conductivity survey confirm that fresh and brackish water appears to be discharging along the coastline from Hapuna Bay to Keawaiki Bay in quantities too small to be easily detected. No anomalously high ground-water levels which might indicate the presence of large ground-water flows were detected.
W69-06006

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT, CH. 3, PROBLEMS OF WATER SUPPLY IN THE BASIN,

National Academy of Sciences-National Research Council, Washington, D. C. Committee on Water.
For primary bibliographic entry see Field 06B.
W69-06088

THE STATUS OF PILOT WATERSHED STUDIES IN ARIZONA,

Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
Harry E. Brown.
Pap, Amer Soc Civ Eng Annu Meet Nat Meet Water Resour Eng, New Orleans, La., Feb 1969. 17 p, 13 fig, 30 ref.

Descriptors: Arizona, Watershed management, *Watersheds (Basins), Snow management, Water yield, *Water yield improvement, Water conservation, Water resources, Runoff, Clearing, Evapotranspiration, Coniferous trees, Evapotranspiration control, Chaparral, Defoliants, Clearing, Vegetation, Streamflow.
Identifiers: Experimental watersheds, Deforestation.

The Forest Service is studying ways to increase water yields in Arizona by manipulating vegetation. Most treatments are designed to reduce evapotranspiration losses and to redistribute snow in a manner conducive to increased runoff efficiency. Principal methods include: (1) mechanical treatments, such as felling or bulldozer cabling coniferous trees; (2) burning chaparral; and (3) chemically treated chaparral and juniper. Examples of changes in streamflow following treatments include: (1) a 1-1/2 times increase following partial clearcutting on a mixed-conifer watershed, (2) at least a 3 times increase following burning and chemical sprout control on a chaparral watershed, and (3) no change following cabling and slash burning on a Utah juniper watershed. Many tests include evaluating changes in sediment, timber, range, and wildlife. On the basis of these and related results, limited treatment programs have been initiated on National Forest lands. Approximately 1,300 acres have been patch cut in mixed-conifer

forests, and approximately 20,000 areas of chaparral-covered lands have been burned or chemically treated. The pilot test indicates that juniper cabling is not promising for increasing water yield. (USBR) W69-06091

EFFECTS OF SMALL STRUCTURES ON WATER YIELD IN TEXAS,

Geological Survey, Austin, Tex.; and Texas Univ., Austin. Dept. of Civil Engineering.

Stanley P. Sauer, and Frank D. Masch.

Geol Surv-Water Resources Div Rep, presented at conf on 'The Effects of Watershed Changes on Streamflow', at Tex Univ, Austin, Oct 1968. 38 p. 7 fig, 7 tab, 14 ref.

Descriptors: *Reservoir evaporation, *Water loss, *Hydrologic budget, *Texas, Consumptive use, Evaporation, Evapotranspiration, Mathematical models, Regression analysis, Forecasting, Water management (Applied), Flood control, Reservoir silting, Seepage.

Identifiers: Reservoir water loss.

Methods of computing consumptive use attributable to water storage in upstream flood control structures are proposed. Using annual data, a direct inflow-outflow relationship and a depletion-runoff relationship are developed. These relationships are not applicable after appreciable amounts of sediments fill the pools. In another approach, monthly consumptive losses are related to climatic parameters and physical characteristics of the structures and soils. These relationships were derived by multiple linear regression analysis, and will still apply as reservoir characteristics change with sedimentation. (Knapp-USGS) W69-06218

HYDROLOGY OF LAND DRAINAGE,

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 04A.

W69-06234

3C. Use of Water of Impaired Quality

PREDICTION OF CROP YIELDS FROM QUANTITY AND SALINITY OF IRRIGATION WATER,

New Mexico State Univ., Las Cruces.

H. E. Dregne.

N Mex Ag Expt Station Bulletin 543, March, 1969. 16 p, 6 tab, 16 fig. OWRR Project A-005-NMEX.

Descriptors: New Mexico, *Crop yields, Water quality, *Salinity, *Irrigation water, Soil salinity, Water requirements, Salt tolerance.

Consumptive use, salt tolerance, and water application data were used to estimate the yields of alfalfa, barley, corn, cotton, and sorghum that would be obtained after irrigation with saline water when different quantities are applied. Corn was the most sensitive to the combination of decreased moisture and increased salinity of the irrigation water, followed by alfalfa, sorghum, cotton, and barley, in that order. Estimates were made of the added water required to maintain satisfactory crop yields as the irrigation water salinity increased. The amounts of water needed became excessive for corn and alfalfa when the irrigation water salinity exceeded about 5 millimhos electrical conductivity. The calculated salinity of the soil after growing the five crops indicated that a cropping sequence of alfalfa-cotton-corn-sorghum-barley would be least likely to affect stands of succeeding crops adversely. After barley, leaching would be required prior to seeding alfalfa. W69-06007

W69-06008

AN ENGINEERING-ECONOMIC ANALYSIS OF SYSTEMS UTILIZING AQUIFER STORAGE FOR THE IRRIGATION OF PARKS AND GOLF-COURSES WITH RECLAIMED WASTEWATER,

Nevade Univ., Reno.

Richard G. Orcutt.

Nevade Center for Water Resources Research Technical Report Series H-W Publ 2, October 1967. 123 p. OWRR Project A-008-NEV.

Descriptors: *Systems analysis, *Model studies, *Water reuse, *Ground-water basin, *Economic feasibility, Analytical studies, Computer models, Irrigation practices, Reclaimed water, Water injection, Aquifer, Water storage, Productivity.

Identifiers: *Las Vegas (Nevada), Hele-Shaw Model, Indigenous water.

A principal objective of this study was to develop a model which would enable the analyst to study the engineering-economic relationships of the elements of wastewater reclamation systems. Available information was used to develop a cohesive model for computing the production costs of wastewater reclamation for irrigation use. After development of the model, the sensitivity of production costs to variations in selected input parameters was examined. Finally the model was applied to a study area, Las Vegas, Nevada, to demonstrate its application and to relate production costs to the benefits from sewerage relief so that the net cost of supplying reclaimed water to irrigation sites could be compared to the cost of alternative sources of supply. The model criterion, that all injected water should be essentially recovered, led to exploratory studies with a Hele-Shaw model from which estimates were made of the amount of indigenous water which would have to be withdrawn from the aquifer. The model enables the analyst to rapidly determine the effect of varying about 40 input parameters on the cost of water production. This article contains 17 illustrations, 12 tables, and 47 references. (Pincolini-Nev) W69-06289

3D. Conservation in Domestic and Municipal Use

STATE WATER SUPPLY DEVELOPMENT.

N J Stat Ann secs 58:19-1 to 58:19-3, 58:19-9 to 58:19-14 (1966).

Descriptors: *New Jersey, *Water resources development, *Administrative agencies, *Water supply, Water sources, Operation and maintenance, State governments, Streams, Condemnation, Eminent domain, Water conservation, Urbanization, Public benefits, Public health, Legislation, Watersheds (Basins), Operating costs, Financing.

The New Jersey Water Supply Law is designed to provide an increase in dependable public water supply sources for domestic and industrial uses. The Act was prompted by governmental recognition of the importance of maintaining adequate water supplies in face of increasing public demand. The Act divides the state into four water supply regions. The criterion for such grouping is available water supply and needs. These divisions are empowered, subject to approval of the Division of Water Development Board, to construct and acquire water supply systems by any means available to natural persons and corporations. The divisions are empowered to institute condemnation proceedings. Surplus water in any public or private water system or watershed can be acquired by the Division where necessary to prevent a regional water shortage. As an incident to acquisition of water systems, the divisions are empowered to operate and maintain the systems and may enter into contracts necessary to carry out this function. The Divisions may integrate public and private water systems where necessary to prevent

shortages. The Divisions may set rates based on cost and capital accounting after a public hearing. (Katz-Fla)

W69-06317

CREATION OF DEPARTMENT OF WATER RESOURCES AND WATER RESOURCES COMMN.

For primary bibliographic entry see Field 06E.

W69-06333

3E. Conservation in Industry

HAUGHTON V LANKFORD (CONSTITUTIONALITY OF CONSERVATION REGULATION).

For primary bibliographic entry see Field 06E.

W69-06329

CREATION OF DEPARTMENT OF WATER RESOURCES AND WATER RESOURCES COMMN.

For primary bibliographic entry see Field 06E.

W69-06333

LE CLAIR V SWIFT (ENFORCEMENT OF CONSERVATION STATUTES).

For primary bibliographic entry see Field 06E.

W69-06377

3F. Conservation in Agriculture

PREDICTION OF CROP YIELDS FROM QUANTITY AND SALINITY OF IRRIGATION WATER,

New Mexico State Univ., Las Cruces.

For primary bibliographic entry see Field 03C.

W69-06007

IRRIGATION WATER QUALITY AND THE LEACHING REQUIREMENT,

New Mexico State Univ., Las Cruces.

H. E. Dregne.

N Mex Ag Expt Station Bulletin 542, January 1969. 17 p, 11 tab, 2 fig, 19 ref. OWRR Project A-005-NMEX.

Descriptors: New Mexico, *Irrigation, Water quality, *Leaching requirements, Alfalfa, Barley, Salt balance, Drainage water.

A greenhouse experiment with barley and alfalfa, two soils, both calcareous and one also gypsiferous, and two irrigation waters, one a carbonate water and the other a non-carbonate water, was conducted to evaluate the validity of the leaching requirement concept. Barley and alfalfa yields were significantly higher when the non-carbonate water was used. Plant ash content did not differ with the two waters. The leaching appeared to be more effective when it was calculated from electrical conductivity of the irrigation and drainage waters than when volume leaching percentages were obtained. Chloride and volume leaching percentages were in good agreement. Carbonate retention and sulfate solution in the soil occurred when the carbonate water was used. Carbonate solution and sulfate retention occurred when the non-carbonate water was used. Carbonate retention and solution were related to the pH of the irrigation water. W69-06008

CONSUMPTIVE IRRIGATION REQUIREMENTS OF SELECTED IRRIGATED AREAS IN NEW MEXICO,

New Mexico Univ., Las Cruces.

Donald C. Henderson, and Earl F. Sorensen.

N Mex Ag Expt Station Bulletin 531, August 1968. 55 p, 15 tab, 2 fig, 9 ref. OWRR Project A-007-NMEX.

IRRIGATION WATER QUALITY AND THE LEACHING REQUIREMENT,
New Mexico State Univ., Las Cruces.
For primary bibliographic entry see Field 03F.

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

Descriptors: New Mexico, *Consumptive use, *Irrigation requirements, Water use, Irrigation efficiency.

The data in this bulletin (appendix tables 1 to 9) are intended to provide consumptive irrigation requirements for general planning purposes and to enable the user to approximate consumptive irrigation requirements of individual crops or the total consumptive irrigation requirement of a given cropping pattern. Except for New Mexico State Engineer hydrographic survey values, the individual consumptive irrigation requirement values of the appendix tables may tend to maximize the amounts required, because maximum growing seasons were generally used. In areas where more detailed and specific field information on local practices, cropping patterns, and other pertinent facts are available, such data should be given consideration in detailed estimates of water-use requirement for specific areas of projects.

W69-06013

HYDRAULIC OPERATING CHARACTERISTICS OF LOW GRADIENT BORDER IRRIGATION SYSTEMS,

Colorado State Univ., Fort Collins. Dept. of Agricultural and Irrigation Engineering.

Orlando W. Howe, James R. Gilley, Dale F.

Heermann, and Norman A. Evans.

Colorado State Univ. Natur Resources Center Proj Completion Rep, Dec 15, 1968. 32 p, 10 fig, 6 tab, 6 ref. OWRR Proj No B-001-COLO.

Descriptors: *Irrigation efficiency, *Irrigation design, *Border irrigation, *Timing, Edge effect, Soil-water-plant relationships, Water delivery, Irrigation water, Water management (Applied), Recession curves.

Identifiers: Border irrigation efficiency, Ditch gradient efficiency.

Intensive study was made of 41 border irrigation plots to determine combinations of gradient, length, intake rate characteristics, surface hydraulic resistance and stream size that result in high irrigation distribution efficiency. Gradients ranged up to 0.005 ft per ft. Water distribution efficiency is independent of stream size within the range of 0.03 to 0.12 cfs per ft border width. Border gradient was not a significant variable within the range studied. The critical variables are cutoff time, which determines whether or not there will be surface runoff, and to some extent the advance and recession rate curves. The operating criteria for cutoff time is distance of advancing front at cutoff, X, compared to length of border, L. For heavy textured soils, the ratio should be X/L between 0.33 and 0.75, while for light textured soils it should be X/L between 0.9 and 1.1. Water distribution efficiencies of 80 to 95% can be obtained consistently. In typical operation, the water is applied for efficiency rather than for a given depth of irrigation. Frequent applications will be necessary to supply crop needs during periods of peak consumption use. (Knapp-USGS)

W69-06035

USE OF WATER FOR SUPPLEMENTAL IRRIGATION IN DELAWARE,

Delaware Univ., Newark. Agricultural Experiment Station.

William M. Crosswhite.

Del Univ Agr Exp Bull No 375, Dec 1968. 24 p, 4 fig, 14 tab. OWRR Proj No B-001-DEL.

Descriptors: *Irrigation efficiency, *Delaware, *Supplemental irrigation, Economic efficiency, Crop production, Crop response, Droughts, Humid climates, Cost-benefit analysis, Profits, Specialty crops, Vegetable crops.

Identifiers: Irrigation costs.

Supplemental irrigation is used in Delaware to increase farm yield by adjusting to dry years and poor rain distribution during the growing season. High-value crops are usually the first to be irrigated. The major irrigated crops are potatoes, peas, lima

beans, and green beans. A total of 17,542 acres were irrigated in 1964, but the largest amount of irrigation water used to date has been about 1.5 billion gal per yr, an amount equal to about 1 day of Delaware's total streamflow. Investment and costs of irrigation systems decline rapidly with increases in the size of the system and number of acres irrigated. Total investment per acre decreased from \$336 for systems with under 25 acres irrigated to \$88 for systems for 150 or more acres. Increased labor efficiency is important in reducing variable costs as the number of acres irrigated by a system expands. The number of acres irrigated per farm increased from 69 acres in 1954 to 100 acres in 1959 and 111 acres in 1964. A detailed study of the yield response of asparagus to irrigation was made using experimental data for the year 1967. An average increase in asparagus yield of 461 lbs resulted when irrigation water was applied. Yields ranged from 191 lbs of asparagus (for 5 ft x 12 in. spacing using no fertilizer) to 1,391 lbs (using 5 ft x 6 in. spacing and applying 2,400 lbs of 5-10-5 fertilizer). Assuming a price of \$20 per cwt for asparagus, the additional yield with irrigation had a gross value of \$38.34 in the first case and \$278.14 in the second. (Knapp-USGS)

W69-06036

PRELIMINARY REPORT ON THE IRRIGATION POTENTIAL OF DUNN COUNTY, WISCONSIN,

Wisconsin Univ., Madison. Geological and Natural History Survey.

For primary bibliographic entry see Field 02G.

W69-06074

MAN'S INFLUENCE ON HYDROLOGICAL PHENOMENA,

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 04C.

W69-06233

QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES-1961,

Geological Survey, Washington, D.C.

S. K. Love.

Geol Surv Water-Supply Pap 1886, 1968. 154 p, 2 fig, 1 plate, 18 ref, index.

Descriptors: *Water quality, *Irrigation water, *Data collections, Streamflow, Hydrologic data, Water chemistry.

Identifiers: *Western U.S., Water quality data.

Water chemical quality and streamflow data of 1961 are compiled for 73 irrigation network stations west of the Mississippi River. Stations are listed with dates of operation. Each quality record includes station location, drainage area, a list of available records, extreme values of specific conductance and sodium content, and periodic records of runoff, silica, Ca, Mg, Na, K, bicarbonate, carbonate, sulfate, Cl, F, nitrate, B, total dissolved solids, % Na, SAR, specific conductance, and pH. (Knapp-USGS)

W69-06253

QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES-1960,

Geological Survey, Washington, D.C.

S. K. Love.

Geol Surv Water-Supply Pap 1746, 1968. 152 p, 2 fig, 1 plate, 17 ref, index.

Descriptors: *Water quality, *Irrigation water, *Data collections, Streamflow, Hydrologic data, Water chemistry.

Identifiers: *Western U.S., Water quality data.

Water chemical quality and streamflow data of 1960 are compiled for 73 irrigation network stations west of the Mississippi River. Stations are listed with dates of operation. Each quality record includes station location, drainage area, a list of

available records, extreme values of specific conductance and sodium content, and periodic records of runoff, silica, Ca, Mg, Na, K, bicarbonate, carbonate, sulfate, Cl, F, nitrate, B, total dissolved solids, % Na, specific conductance and pH. (Knapp-USGS)

W69-06254

CRITES V UNITED STATES (CLAIMS FOR LOSS IN VALUE OF LAND DUE TO IRRIGATION PROJECT).

132 F Supp 469-472 (Ct Cl 1955).

Descriptors: *United States, *Condemnation, *Irrigation programs, *Flow augmentation, Rivers, Damages, Reservoirs, Washington, Flood control, Open channel flow, River flow, Flow rates, Drainage, Surface runoff, Aggradation, Judicial decisions, Legal aspects, Crop production, Federal government.

Identifiers: Yakima River.

Congress referred several claims against the United States for alleged damage to farms due to irrigation control of the Yakima River to the Court of Claims. During certain seasons, a control project of the Department of the Interior increased the flow in the river and channels adjacent to and cutting through plaintiff's properties. Plaintiffs alleged that the operation had impaired the usefulness of their lands during the normal farming season and that such constituted a taking of their property for which compensation must be paid. The court found no legal or equitable liability and stated that, although the usefulness of plaintiffs' lands had been impaired because of the action of the river, the court was unable, on the basis of the record, to find the government responsible or to find that there had been a material decrease in value of the lands. (Wheeler-Fla)

W69-06325

STATE FORESTS; TREE PLANNING.

Minn Stat Ann secs 89.001 and 89.26 (1946), as amended, (Supp 1968).

Descriptors: *Minnesota, *Forest management, *Hydrology, *Water conservation, Hydraulics, Water control, Water resources, Hydroelectric plants, Watercourses (Legal), Water policy, Project planning, Water utilization, Waterworks, Trees, Forests, Pulp and paper industry, Climates, Legislation, Legal aspects, State governments, Hydroelectric power.

Identifiers: *Water power.

The phrase 'state forest lands' means all land and water owned by the state within state forests. All water power having a possible average development of 100-horse power or more owned by the state and all state owned or controlled lands lying within one mile of such water power are withdrawn from sale and held for the purpose of the improvement and utilization of the same for the purpose of having paper manufactured by plants built on and using the power of such water powers. (Shevin-Fla)

W69-06338

IRRIGATION.

Minn Stat Ann secs 113.01 to 113.06 (1947), as amended (Supp 1968).

Descriptors: *Minnesota, *Irrigation, *Dams, *Irrigation permits, Dikes, Dam construction, Construction, Ditches, Drainage systems, Watercourses, Floods, High water mark, Engineers, Damages, Irrigation engineering, Irrigable land, Irrigation programs, Irrigation water, Water sources, Legislation, Diversion, Alteration of flow, Design, Floodgates, Legal aspects.

Identifiers: Penalties (Criminal).

Any person owning land suitable for raising crops requiring irrigation, upon being licensed, may construct upon his land and across any public ditch, drain, or watercourse, a dam or dike necessary to secure the use of water for irrigation. All dams must contain gates sufficient to carry off flood water above the high water mark within 24 hours. Licenses to build such a dam must be obtained from the state drainage engineer. The person constructing the dam must post a bond which would be used to pay any one injured by the construction of the dams or any property damage resulting from its use. The construction of the dams is to be under the supervision of the state drainage engineer. If it appears that the dam cannot be operated without impairing the utility of a public drain or watercourse or without depriving other landowners of enjoyment of their land, the license shall be revoked. Any person violating any section of the act shall be guilty of a misdemeanor. (Shevin-Fla) W69-06340

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

FLOOD PLAIN INFORMATION, UPPER FLINT RIVER, MUD AND JESTER CREEKS, METROPOLITAN ATLANTA, GEORGIA.

Corps of Engineers, Mobile, Ala.

Prepared for Atlanta Metropolitan Planning Comm. Corps Eng Flood Plain Rep, Jan 1969. 50 p, 8 fig, 26 plate, 17 tab.

Descriptors: *Floods, *Flood damage, *Georgia, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.

Identifiers: Atlanta (Ga), Flint River, Standard project flood, Intermediate regional flood.

Flooding of the Upper Flint River, Mud and Jester Creeks, Atlanta, Georgia is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS) W69-06057

FLOOD PLAIN INFORMATION, CASEY CANAL NORTH, SAVANNAH AND CHATHAM COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.

Corps Eng Flood Plain Rep, Aug 1968. 35 p, 16 fig, 14 plate, 6 tab. Prepared for city of Savannah and Chatham County.

Descriptors: *Floods, *Flood damage, *Georgia, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Savannah (Ga), Chatham County, Casey Canal, Standard project flood, Intermediate regional flood.

Flooding of Casey Canal, North Savannah and Chatham Counties, Georgia is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood

damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS) W69-06058

FLOOD PLAIN INFORMATION, TAR RIVER AND STONY CREEK, ROCKY MOUNT, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.

Corps Eng Flood Plain Rep, Aug 1968. 63 p, 18 fig, 19 plate, 13 tab. Prepared for city of Rocky Mount.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.

Identifiers: Rocky Mount (NC), Tar River, Stony Creek, Standard project flood, Intermediate regional flood.

Flooding of Tar River and Stony Creek, Rocky Mount, North Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS) W69-06059

FLOOD PLAIN INFORMATION, COBBS CREEK-FOWLER BRANCH, DEKALB COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.

Corps Eng Flood Plain Rep, June 1968. 35 p, 12 fig, 19 plate, 13 tab. Prepared for DeKalb County, Ga.

Descriptors: *Floods, *Flood damage, *Georgia, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: DeKalb County (Ga), Cobbs Creek, Fowler Branch, Standard project flood, Intermediate regional flood.

Flooding of Cobbs Creek and Fowler Branch, DeKalb County, Georgia is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combination of these approaches. (Knapp-USGS) W69-06060

FLOOD PLAIN INFORMATION, ROCK RIVER AT JANESEVILLE, WISCONSIN.

Corps of Engineers, Rock Island, Ill.

Prepared for State of Wisconsin, Dept of Natural Resources. Corps Eng Flood Plain Rep, June 1968. 53 p, 36 fig, 14 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *Wisconsin, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Janesville (Wis), Rock River, Standard project flood, Intermediate regional flood.

Flooding of the Rock River, Janesville, Wisconsin is described in a report of flood plain problems based on records of rainfall, runoff, and historical

and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS) W69-06061

FLOOD PLAIN INFORMATION, BIG WALNUT CREEK, VICINITY OF COLUMBUS, OHIO.

Corps of Engineers, Huntington, W. Va.

Corps Eng Flood Plain Rep, May 1968. 39 p, 9 fig, 12 plate, 7 tab. Prepared for State of Ohio, Dept Nat Res.

Descriptors: *Floods, *Flood damage, *Ohio, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Columbus (Ohio), Big Walnut Creek, Standard project flood, Intermediate regional flood.

Flooding of Big Walnut Creek, Columbus, Ohio is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS) W69-06062

FLOOD PLAIN INFORMATION, HUNNICKUTT CREEK, ATHENS, CLARKE COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.

Corps Eng Flood Plain Rep, Apr 1968. 28 p, 8 fig, 10 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *Georgia, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Athens (Ga), Clarke County, Hunnicutt Creek, Standard project flood, Intermediate regional flood.

Flooding of Hunnicutt Creek, Athens, Clarke County, Georgia is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS) W69-06063

FLOOD PLAIN INFORMATION, TAR RIVER AT LOUISBURG, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.

Corps Eng Flood Plain Rep, Mar 1968. 34 p, 8 fig, 6 plate, 7 tab.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.

Identifiers: Louisburg (NC), Tar River, Standard project flood, Intermediate regional flood.

Flooding of the Tar River, Louisburg, North Carolina is described in a report of flood plain

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problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06064

FLOOD PLAIN INFORMATION, DICKINSON BAYOU, DICKINSON, TEXAS. Corps of Engineers, Galveston, Tex.

Corps Eng Flood Plain Rep, Feb 1968. 36 p, 9 fig, 22 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Texas, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Hurricanes, Historic flood.
Identifiers: Dickinson (Texas), Dickinson Bayou, Standard project flood, Intermediate regional flood, Tropical storms.

Flooding of Dickinson Bayou, Dickinson, Texas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06065

FLOOD PLAIN INFORMATION, ELLERBE, GOOSE, WARREN, SANDY AND THIRD FORK CREEKS, DURHAM, NORTH CAROLINA. Corps of Engineers, Wilmington, N. C.

Corps Eng Flood Plain Rep, Jan 1968. 60 p, 15 fig, 12 plate, 19 tab.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Durham (NC), Standard project flood, Intermediate regional flood.

Flooding of Ellerbe, Goose, Warren, Sandy, and Third Fork Creeks, Durham, North Carolina, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06066

FLOOD PLAIN INFORMATION, TURTLE CREEK, ROCK COUNTY, WISCONSIN. Corps of Engineers, Rock Island, Ill.

Corps Eng Flood Plain Rep, Dec 1967. 60 p, 48 fig, 14 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *Wisconsin, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: Rock County (Wis), Turtle Creek, Standard project flood, Intermediate regional flood.

Flooding of Turtle Creek, Rock County, Wisconsin is described in a report of flood plain problems

based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06067

FLOOD PLAIN INFORMATION, BEAVERDAM CREEK, PRINCE GEORGES COUNTY, MARYLAND. Corps of Engineers, Baltimore, Md.

Corps Eng Flood Plain Rep, Sept 1967. 23 p, 2 fig, 8 plate, 6 tab.

Descriptors: *Floods, *Flood damage, *Maryland, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Prince Georges County (Md), Beaverdam Creek, Standard project flood, Intermediate regional flood.

Flooding of Beaverdam Creek, Prince Georges County, Maryland is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06068

FLOOD PLAIN INFORMATION, OTTAWA RIVER, ALLEN COUNTY, OHIO. Corps of Engineers, Detroit, Mich.

Corps Eng Flood Plain Rep, June 1967. 21 p, 3 photo, 8 tab, 1 append.

Descriptors: *Floods, *Flood damage, *Ohio, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Allen County (Ohio), Ottawa River, Standard project flood, Intermediate regional flood.

Flooding of the Ottawa River, Allen County, Ohio is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06069

FLOOD PLAIN INFORMATION, OHIO RIVER, JEFFERSON COUNTY, KENTUCKY. Corps of Engineers, Louisville, Ky.

Prepared for Louisville and Jefferson County Planning Commission. Corps Eng Flood Plain Rep, June 1967. 33 p, 6 fig, 17 plate, 6 tab.

Descriptors: *Floods, *Flood damage, *Ohio River, *Kentucky, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: Jefferson County (Ky), Standard project flood, Intermediate regional flood.

Flooding of the Ohio River, Jefferson County, Kentucky is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06070

HEREDA V LOWER BURRELL TP (UNNATURAL WATER AND SEWAGE DISCHARGE). For primary bibliographic entry see Field 06E. W69-06123

PALMER V MASSENGILL (OBSTRUCTION TO FLOW OF ARTIFICIAL WATERCOURSE). For primary bibliographic entry see Field 06E. W69-06147

SAELENS V POLLENTIER (SUIT TO ENJOIN DEFENDANT'S INTERFERENCE WITH THE FLOW OF SURFACE WATERS). For primary bibliographic entry see Field 06E. W69-06149

STANDARD WAREHOUSE CO V ATLANTIC COAST LINE RR (NEGLIGENCE CONSTRUCTION AND MAINTENANCE OF A DRAINAGE SYSTEM). For primary bibliographic entry see Field 06E. W69-06152

BELVEAL V H B C DEVELOPMENT CO (OBSTRUCTION OF NATURAL WATERCOURSE AND CONCENTRATION OF FLOW). For primary bibliographic entry see Field 06E. W69-06154

WHEATLEY V CASS COUNTY (DIVERSION OF NATURAL FLOW OF FLOOD WATERS BY THE STATE FOLLOWED BY SUBSEQUENT RESUMPTION OF SAME FLOW). For primary bibliographic entry see Field 06E. W69-06156

KEYTON V MISSOURI-KANSAS-TEXAS RR (ACTION FOR DAMAGES CAUSED BY OBSTRUCTING NATURAL FLOW OF SURFACE WATER). For primary bibliographic entry see Field 06E. W69-06162

CASANOVER V VILLANOVA REALTY CO (DIKE REMOVAL AND RUNOFF). For primary bibliographic entry see Field 06E. W69-06163

CITY OF MACON V CANNON (SURFACE WATER RUNOFF). For primary bibliographic entry see Field 06E. W69-06166

TAYLOR V HARRISON CONSTR CO (ARTIFICIAL INCREASE OF SURFACE WATERS). For primary bibliographic entry see Field 06E. W69-06167

GREENBURG V CITY OF STEUBENVILLE (DAMAGE CAUSED BY AN ACT OF GOD AND CONCURRENT NEGLIGENCE). For primary bibliographic entry see Field 06E. W69-06170

ACCURATE DIE CASTING CO V CITY OF CLEVELAND (FLOOD DAMAGE FROM SUB-SURFACE DRAINAGE).

For primary bibliographic entry see Field 06E.
W69-06171

CITY OF JACKSON V COOK (COMPENSATION FOR DAMAGES FROM NEGLIGENT DISPOSAL OF DRAINAGE WATER).

For primary bibliographic entry see Field 06E.
W69-06174

PETER WENDEL AND SONS V CITY OF NEWARK (DAMAGE FROM ARTIFICIAL DRAINAGE SYSTEM).

For primary bibliographic entry see Field 06E.
W69-06176

MAYOR OF AMERICUS V BRIGHTWELL (SURFACE DRAINAGE AND ALTERATION OF FLOW).

For primary bibliographic entry see Field 06E.
W69-06177

CITY OF JACKSON V ROBERTSON (INJUNCTION AGAINST DISCHARGING DRAINAGE UPON LOWER PROPERTY).

For primary bibliographic entry see Field 06E.
W69-06179

CLOUGH V STATE (ARTIFICIAL DIVERSION OF NATURAL WATERCOURSES).

For primary bibliographic entry see Field 06E.
W69-06184

KENNEDY V UNION ELECTRIC CO OF MISSOURI (SILT ACCRETION AND FLOODING).

For primary bibliographic entry see Field 06E.
W69-06188

HARGADINE V SHARKEY (DIVERSION OF WATER FROM ITS NATURAL COURSES).

For primary bibliographic entry see Field 06E.
W69-06193

ARCHER V J S COMPTON, INC (INTERFERENCE WITH NATURAL FLOW).

For primary bibliographic entry see Field 06E.
W69-06196

HEPBURN V MADDOX (LIABILITY OF DRAINAGE DISTRICT).

For primary bibliographic entry see Field 06E.
W69-06197

UNITED STATES V SHAPIRO (RIGHT TO REPEL SURFACE WATER).

For primary bibliographic entry see Field 06E.
W69-06198

RATCLIFFE V INDIAN HILL ACRES (RIGHTS TO DISPOSE OF SURFACE RUNOFF WATERS).

For primary bibliographic entry see Field 06E.
W69-06199

SURFACE DRAINAGE CHARACTERISTICS IN VOLUSIA COUNTY, FLORIDA,

Geological Survey, Ocala, Fla.
For primary bibliographic entry see Field 02E.
W69-06216

HYDROLOGY OF LAND DRAINAGE,
Research Inst. for Water Resources Development,
Budapest (Hungary).

G. Kienitz.

2nd Int Postgrad Course on Hydrol Methods for Develop Water Resources Manage, Budapest, Hung, Jan-July 1968, Manual No 15, 1968. 94 p, 14 fig, 1 tab, 20 ref.

Descriptors: *Drainage, *Drainage engineering, Subsurface drainage, Surface drainage, Systems analysis, Linear programming, Synthetic hydrology, Model studies, Mathematical models, Hydrograph analysis, Unit hydrographs, Hydrology, Land management, Water management (Applied), Land reclamation, Soil water movement, Groundwater movement, Water quality.
Identifiers: *Textbooks, *Technical manuals.

The hydrological bases of surface and subsurface land drainage engineering are explained in a technical manual presented as a chapter of a text written for an international post-graduate course in water resources management. Methods are given to calculate and predict water yield to drainage systems, drawdown curves, runoff, streamflow, and economic costs and benefits of drainage systems. Drainage spacing and geometry are discussed and planning schemes are presented. Drainage research is described and the results of projects in several countries are examined. Both synthetic and analytical hydrologic models are used to calculate drainage needs and results. (Knapp-USGS)
W69-06234

FLOOD PLAIN INFORMATION, RICHLAND COUNTY, SOUTH CAROLINA.
Corps of Engineers, Charleston, S. C.

Corps Eng Flood Plain Rep, Aug 1968. 56 p, 13 fig, 27 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *South Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: Richland (SC), Crane Creek, Smith Branch, Standard project flood, Intermediate regional flood.

Flooding of Crane Creek and Smith Branch, Richland County, South Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06238

FLOOD PLAIN INFORMATION, GUADALUPE RIVER, SPRING CREEK AND LONE TREE CREEK, VICTORIA, TEXAS.

Turner, Collie and Braden, Inc., Houston, Tex.

Corps Eng Flood Plain Rep, July 1968. 46 p, 8 fig, 27 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *Texas, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: Victoria (Tex), Guadalupe River, Spring Creek, Lone Tree Creek, Standard project flood, Intermediate regional flood.

Flooding of the Guadalupe River, Spring Creek, and Lone Tree Creek, Victoria, Texas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction

of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06239

FLOOD PLAIN INFORMATION, SABINE RIVER AND ADAMS BAYOU, ORANGE, TEXAS AREA.
Turner, Collie and Braden, Inc., Houston, Tex.

Corps Eng Flood Plain Rep, July 1968. 45 p, 8 fig, 25 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *Texas, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: Orange (Tex), Sabine River, Standard project flood, Intermediate regional flood.

Flooding of the Sabine River and Adams Bayou, Orange, Texas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works or by combinations of these approaches. (Knapp-USGS)
W69-06240

FLOOD PLAIN INFORMATION, DICKINSON, NORTH DAKOTA DRAINAGE DITCH.
Corps of Engineers, Omaha, Neb.

Corps Eng Flood Plain Rep, June 1968. 21 p, 6 plate, 1 map, 3 tab.

Descriptors: *Floods, *Flood damage, *North Dakota, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Dickinson (ND), Standard project flood, Intermediate regional flood.

Flooding of the Dickinson, North Dakota drainage ditch is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06241

FLOOD PLAIN INFORMATION, PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
Corps of Engineers, Pittsburgh, Pa.

Corps Eng Flood Plain Rep, Mar 1968. 27 p, 2 fig, 9 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *Pennsylvania, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Bentleyville (Pa), Fallowfield Township, Somerset Township, Pigeon Creek, Standard project flood, Intermediate regional flood.

Flooding of Pigeon Creek, Bentleyville, Fallowfield Township, and Somerset Township, Pennsylvania is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability

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to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06242

FLOOD PLAIN INFORMATION, CUMBERLAND RIVER, ROARING RIVER, AND DOE CREEK, GAINESBORO, TENNESSEE.

Corps of Engineers, Nashville, Tenn.

Corps Eng Flood Plain Rep, Feb 1968. 65 p, 8 fig, 16 plate, 17 tab.

Descriptors: *Floods, *Flood damage, *Tennessee, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Gainesboro (Tenn), Cumberland River, Roaring River, Doe Creek, Standard project flood, Intermediate regional flood.

Flooding of the Cumberland River, Roaring River, and Doe Creek, Gainesboro, Tennessee is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06243

FLOOD PLAIN INFORMATION, SKOOKUMCHUCK RIVER, BUCODA, WASHINGTON.

Corps of Engineers, Seattle, Wash.

Corps Eng Flood Plain Rep, Feb 1968. 31 p, 4 fig, 9 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *Washington, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood. Identifiers: Bucoda (Wash), Skookumchuck River, Standard project flood, Intermediate regional flood.

Flooding of the Skookumchuck River, Bucoda, Washington is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06244

FLOOD PLAIN INFORMATION, LAWSONS FORK CREEK AND FAIRFOREST CREEK, SPARTANBURG, SOUTH CAROLINA.

Corps of Engineers, Charleston, S.C.

Corps Eng Flood Plain Rep, Feb 1968. 70 p, 19 fig, 25 plate, 16 tab.

Descriptors: *Floods, *Flood damage, *South Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Spartanburg (SC), Lawsons Fork Creek, Fairforest Creek, Standard project flood, Intermediate regional flood.

Flooding of Lawsons Fork Creek and Fairforest Creek, Spartanburg, South Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sec-

tions indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06245

FLOOD PLAIN INFORMATION, SOUTH FORK OF FORKED DEER RIVER AND SUGAR CREEK, HENDERSON, TENNESSEE.

Corps of Engineers, Memphis, Tenn.

Corps Eng Flood Plain Rep, Jan 1968. 48 p, 7 fig, 11 plate, 12 tab.

Descriptors: *Floods, *Flood damage, *Tennessee, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Henderson (Tenn), Forked Deer River, Sugar Creek, Standard project flood, Intermediate regional flood.

Flooding of the Forked Deer River and Sugar Creek, Henderson, Tennessee is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06246

FLOOD PLAIN INFORMATION, ARROYO DE LOS CHAMISOS AND ARROYO HONDO, SANTA FE, NEW MEXICO.

Corps of Engineers, Albuquerque, N. Mex.

Corps Eng Flood Plain Rep, Dec 1967. 34 p, 5 fig, 20 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *New Mexico, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.

Identifiers: Santa Fe (N Mex), Arroyo de los Chamisos, Arroyo Hondo, Standard project flood, Intermediate regional flood.

Flooding of the Arroyo de los Chamisos and Arroyo Hondo, Santa Fe, New Mexico is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06247

FLOOD PLAIN INFORMATION, CLARK FORK, MISSOULA, MONTANA.

Corps of Engineers, Seattle, Wash.

Corps Eng Flood Plain Rep, Nov 1967. 32 p, 4 fig, 9 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *Montana, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood. Identifiers: Missoula (Montana), Clark Fork, Standard project flood, Intermediate regional flood.

Flooding of Clark Fork, Missoula, Montana is described in a report of flood plain problems based

on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-06248

HARVESTING UNDERWATER WEEDS, WISCONSIN UNIV., MADISON. DEPT. OF MECHANICAL ENGINEERING.

For primary bibliographic entry see Field 05G.
W69-06276

THE LAW OF WATER IN NEW JERSEY, RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. SCHOOL OF LAW.

For primary bibliographic entry see Field 06E.
W69-06301

PHILLIPS V CHESSON (DIVERSION CAUSED BY EXCAVATED SLOPE).

231 NC 566, 58 SE 2d 343-348 (1950).

Descriptors: *North Carolina, *Damages, *Market value, *Natural flow doctrine, Diversion, Slopes, Surface waters, Discharge (Water), Overland flow, Overflow, Surface runoff, Excavation, Rain water, Legal aspects, Judicial decisions, Real property. Identifiers: *Permanent damages, *Temporary damages, Injunctions (Mandatory), Dominant estates, Servient estates.

Plaintiff brought suit to recover damages for the dumping of clay excavation from defendant's lot and for diversion of water from said lot onto plaintiff's lower lot; included in the complaint was a prayer for a mandatory injunction requiring correction of such injurious conditions. The governing rule of law is that defendants, as owners of land on a higher level than adjoining land, cannot divert surface water or interfere with its natural flow, by artificial obstruction or device, without incurring liability to the owner of the lower lot. However, as a general rule, the decrease in market value of plaintiff's property will not be the measure of damages for a temporary injury to real estate; only when the injury is permanent is the decrease in fair market value an appropriate measure of damages. Thus, the trial judge's instruction to jury that plaintiff could recover, if at all, the decrease in reasonable market value of his property directly resulting from defendant's wrongful diversion of water, was erroneous. (Reed-Fla)
W69-06309

MESSANA V MAULE INDUSTRIES (NEGIGENT FLOODING OF FARM LAND).

50 So 2d 874-877 (Fla 1951).

Descriptors: *Florida, *Flood damage, *Crops, *Pumping, Legislation, Judicial decisions, Legal aspects, Floods. Identifiers: Fact pleading, Causes of action, Motions to dismiss, Punitive damages, Intentional torts.

Plaintiff brought action for damages to his farm land allegedly due to his neighbor's willful and wanton negligence in pumping water onto the plaintiff's land. The trial judge dismissed the complaint for failure to state a cause of action. The Florida Supreme Court reversed the lower court's decision, holding that the complaint was sufficient to state a cause of action under the new common law rules of pleading. (Watson-Fla)
W69-06310

Control of Water on the Surface—Group 4A

DAVENPORT V TOWN OF DANVERS (FLOODING OF LAND BY CITY DAM).

126 NE 2d 530-531 (Mass 1955).

Descriptors: *Massachusetts, *Flooding, *Dams, *Municipal water, Backwater, Dam construction, Judicial decisions, Legal aspects, Reservoirs, Water supply, Damages, Streams, Legislation, Cities, Eminent domain, Overflow, Flood damage, Mills, Mill dams, Engineering structures, Riparian rights, Riparian land, Obstruction to flow.

Identifiers: Demurrers, Injunctions (Mandatory), Injunctions (Prohibitory).

Plaintiff brought action for damages and to enjoin flooding of his land due to the construction of a dam by the defendant town on a creek running through the plaintiff's property. The trial court sustained the city's demurrer and dismissed the plaintiff's bill. The supreme judicial court held that the demurrer should not have been sustained because it was based upon the allegation that the dam was built pursuant to legislation which allowed the taking of water for municipal purposes, and this fact was not established by the pleadings. The court stated that the landowner could recover damages and that the requested injunction should be granted. The appellate court further stated that the town derived no authority to flood property from mill acts; these acts related only to the construction and maintenance of dams for water mills. (Watson-Fla)

W69-06311

ATCHLEY V TENNESSEE VALLEY AUTHORITY (FLOODING OF CROPS CAUSED BY RAISED RESERVOIR WATERS).

69 F Supp 952-956 (N D Ala 1947).

Descriptors: *United States, *Tennessee Valley Authority Project, *Flood control, *Reservoirs, Crops, Navigable rivers, Administrative decisions, Flooding, Dams, Navigation, Floodwater, Impoundments, Water allocation (Policy), Flood damage, Legislation, Judicial decisions, Overflow, Administrative agencies, Legal aspects, Federal government.

Plaintiffs brought action against the Tennessee Valley Authority to recover for destruction of crops as a result of a flood allegedly caused by defendant's negligence. Defendant moved for summary judgment. Plaintiffs asserted that defendant's employees, acting within the scope of their employment in the operation of the Congressionally-authorized unified system of dams and other structures, negligently raised reservoir waters until they overflowed and flooded plaintiffs' crops. The court declared that Congress did not intend that defendant be liable in connection with its handling of the waters placed under its control. The sue-and-be-sued clause in the Tennessee Valley Authority Act merely removes the procedural bar to suit against a federal agency; it does not impose liability where liability would not otherwise exist. It is well established that federal agencies are not liable for consequential damages arising out of the operation of a navigation improvement. The court ruled that since the performance by executive officers of discretionary governmental duties is not subject to judicial review, defendant's motion for summary judgment must be sustained. (Reed-Fla)

W69-06321

CITY OF MERIDAN V SULLIVAN (SUBSURFACE DRAINAGE).

45 So 2d 851-853 (Miss 1950).

Descriptors: *Mississippi, *Subsurface drainage, *Culverts, *Drains, Obstruction to flow, Soil erosion, Damages, Judicial decisions, Conveyance structures, Running waters, Cities, Local governments, Drainage water, Drainage systems, Flood damage, Alteration of flow, Maintenance, Repairing.

The plaintiff brought this suit to recover for damages to her land caused by two negligent acts of the defendant. The plaintiff alleged that the defendant had negligently broken a large hole in plaintiff's culvert which was not repaired. Furthermore, the plaintiff alleged that the defendant was negligent in failing to keep its culverts free from obstruction. As a result of the obstructions in the defendant's culvert, which was located across the street from the plaintiff's property, large quantities of water were forced up through the hole in the plaintiff's culvert and onto plaintiff's land. The result of this flooding was a gradual erosion of the foundations of plaintiff's house. The court found that the evidence was adequate to show that defendant had committed both acts of negligence complained of and that such acts combined to cause the damage sustained by the plaintiff. (Stewart-Fla)

W69-06322

BELUE V CITY OF GREENVILLE (DUTY OF CITY TO PROVIDE DRAINAGE OF THOROUGHFARES).

84 SE 2d 631-636 (SC 1954).

Descriptors: *South Carolina, *Cities, *Road construction, *Surface drainage, Land tenure, Legal aspects, Legislation, Damages, Drains, Backwater, Obstruction to flow, Judicial decisions, Excessive precipitation, Flooding, Landfill, Valve.

Identifiers: *Acts of God, Proximate cause, Debris.

Plaintiff owned a lot adjacent to a street in defendant city. Previously, the contour of plaintiff's lot had been such as to insure adequate drainage of surface water. Plaintiff alleged that the city installed curbing and gutters which destroyed plaintiff's drainage and caused excess water to concentrate on his lot. Defendant city answered, stating that plaintiff's land was a natural drain, and that the rains which caused the alleged damage were acts of God. The trial court rendered judgment for plaintiff. On appeal, the supreme court held that since the damage could be partially attributed to human agency, it was not caused by an act of God. The court found that, by filling in plaintiff's drain, the city had caused water to back up and cast debris upon plaintiff's land. This action by the city violated a state statute requiring municipalities to provide for adequate drainage of its thoroughfares. The court held plaintiff could recover for actual damages and for depreciation in property value due to the likelihood of future flooding. (Harris-Fla)

W69-06323

HILL V CITY OF GREENVILLE (DAMAGES RESULTING FROM CITY'S FAILURE TO PROVIDE DRAINAGE).

76 SE 2d 294-299 (SC 1953).

Descriptors: *South Carolina, *Cities, *Drainage, *Road construction, Highways, Paving, Drains, Ditches, Legislation, Local governments, State governments, Flooding, Surface water, Drainage programs, Administration, Legal aspects, Judicial decisions, Damages, Public rights.

Plaintiff property owners brought this suit to collect for damage caused by defendant municipality's failure to provide drainage facilities to protect plaintiff's property from surface water entering the land from a ditch in the street. This accumulation of surface water first occurred when the state highway department paved and later installed curbs and gutters on a road near plaintiff's property. Later, plaintiffs' property was annexed to defendant municipality and plaintiffs demanded that city provide drainage to protect their property. Defendant refused to provide the drainage. The appellate court held that no person can claim drainage as a right where such is not provided for by statute. No statute in this state bestows such right upon plaintiff. Furthermore, the court felt it unfair to hold the city liable for delict of the state highway department committed years before plaintiffs' property became a part of the city. Judgment was rendered in favor of the municipality. (Logan-Fla)

W69-06324

POWERS AND FUNCTIONS OF DEPARTMENT OF WATER RESOURCES - FLOOD CONTROL.
Md Ann Code Art 96A:50-58 (1957), as amended, (Supp 1968).

Descriptors: *Maryland, *Flood control, *Watershed management, *Administrative agencies, Legislation, Water control, Legal aspects, Water management (Applied), Programs, Federal government, State governments, Project planning, Water works, Long-term planning, Regulation, Flood protection, Land management, Reservoirs, Water supply, Supply contracts, Water storage, Water costs, Real property, Eminent domain, Local governments, Adjudication procedure.

The Maryland Department of Water Resources is responsible for and must cooperate with federal and local governments in developing and implementing a long range flood control program, and shall serve as a liaison to such governments in all flood control matters. The Department provides technical and financial assistance to local governments and other agencies in interpreting flood information and in drafting regulations pertaining to areas subject to flooding. Plans for local public works are reviewed by the Department, which also controls all such works. The state may acquire real property interests whenever the general assembly determines such action is necessary for proper land and watershed management. The department may estimate water-storage needs in federally constructed reservoirs and may contract with federal authorities for repayment of water supply costs. Any party aggrieved by a final decision of the Department may petition for a hearing by the Water Resources Commission. (Wheeler-Fla)

W69-06332

GOULD AND EBERHARDT, INC V CITY OF NEWARK (DISCHARGE OF SURFACE WATERS FROM STORM SEWER).

6 NJ 240, 78 A 2d 77-79 (1951).

Descriptors: *New Jersey, *Discharge (Water), *Drainage water, *Drainage systems, Cities, Natural flow, Overflow, Alteration of flow, Storm drains, Surface waters, Storm runoff, Outlet works, Remedies, Relative rights, Contracts, Construction, Projects.

Identifiers: *Equitable estoppel, Injunctions (Prohibitory), Laches.

Plaintiff brought this action against defendant city to enjoin the further discharge of storm and surface waters onto plaintiff's property from a storm sewer system constructed and maintained by defendant. Before undertaking the construction of the sewer system, the city consulted plaintiff and outlined its plans. After considering the project, plaintiff gave its consent. Over nineteen years passed before plaintiff expressed its dissatisfaction with the project. The city asserted that plaintiff should be estopped from claiming equitable relief because it had given its consent before the construction was undertaken. The court pointed out that a municipality's collection and discharge of surface waters upon private property in greater quantity than would occur from the natural flow is an active wrongdoing for which a court of equity can grant injunctive relief. However, while the court will not protect an active wrongdoer under the doctrine of equitable estoppel, in the present case, the city was not guilty of active wrongdoing since it was acting in reliance upon plaintiff's express consent. Therefore, the court held that plaintiff, having had knowledge of and having assented to the construction and having enjoyed the benefit of it for many years, was not entitled to the relief sought. (Reed-Fla)

W69-06357

STATE V BOSTIAN (EMINENT DOMAIN AND MUNICIPAL WATER SUPPLY).

For primary bibliographic entry see Field 06E.

W69-06358

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

WOODWARD IRON CO V MUMPOWER (DAMAGE TO SURFACE OWNERS RIGHTS FROM MINING OPERATIONS).

28 So 2d 625-629 (Ala 1947).

Descriptors: *Alabama, *Mining, *Land subsidence, *Damages, Surfaces, Legal aspects, Land tenure, Springs, Wells, Soil surfaces, Relative rights, Coal mines, Compensation, Judicial decisions, Water supply, Stock water.

Identifiers: *Absolute liability, *Robbing.

Plaintiff owned the surface rights in a certain tract of land; defendant owned the mineral rights in the same tract. Defendant conducted mining operations under the land. These mining activities included 'robbing' operations. Plaintiff relied upon a spring, stream, and well to supply water and irrigate pasture land for dairy cattle. Plaintiff had substantially improved the property by erecting certain dwellings thereon. The evidence showed that the spring and wells went dry and that large breaks appeared in the land which caused plaintiff's dwellings to sag and shift. Plaintiff was forced to haul water at great expense and inconvenience in order to carry on his business and was finally forced to suspend dairy operations. Plaintiff received a \$10,000 judgment in the trial court. On appeal, the supreme court held that liability for damages of the character described was absolute and that defendant's allegations as to his exercise of due care were immaterial. The court said that defendant's expert testimony was to be considered with other evidence and was not conclusive on the issue of liability. The jury was correct in considering plaintiff's annoyance and inconvenience in arriving at its determination of damages. (Harris-Fla)

W69-06359

STIGALL V SHARKEY COUNTY (DESTRUCTION OF DRAINAGE FACILITIES CAUSING FLOOD DAMAGE).

57 So 2d 146-148 (Miss 1952).

Descriptors: *Mississippi, *Obstruction to flow, *Surface drainage, *Flooding, Laterals, Culverts, Landfills, Barriers, Canals, Legal aspects, Judicial decisions, Road construction, Backwater, Natural flow doctrine, Remedies, Adjudication procedure, Ditches, Crops, Governments, Compensation, Flood damage.

Identifiers: Injunctions (Mandatory).

The complainants alleged that their land was adequately drained by 3 drainage canals and a lateral ditch which fed one canal. They further alleged that the defendant county filled the lateral ditch in order to construct a road thereon and built a road across one of the canals; this latter road was equipped with inadequate drainage culverts. Complainants claim damages to crops by flooding and seek a mandatory injunction requiring removal of the alleged obstructions to natural drainage. The chancery court entered judgment for the defendant county. The supreme court held that damages should be determined by reference to the itemized statement of crop damages, not by application of the before-and-after test. The court further held that the chancellor had power to issue an injunction requiring the county to correct the drainage inadequacies if the facts and equities require such an order. (Harris-Fla)

W69-06360

HALL V CITY OF GREENVILLE (STATUTORY DUTY OF CITY TO PROVIDE ADEQUATE STREET DRAINAGE).

88 SE 2d 246-254 (SC 1955).

Descriptors: *Flood damage, *South Carolina, *Road construction, *Drainage, Legal aspects, Land tenure, Legislation, Cities, Alteration of flow, Backwater, Floods, Drains, Relative rights, Judicial decisions, Local governments, Concrete structures, Surface waters, Surface drainage, Damages, Roads.

Identifiers: Questions of fact.

Plaintiffs sought to recover for flood damage to property. Plaintiffs alleged that defendant city violated a statute requiring it to adequately drain its streets and thoroughfares in order to prevent passage of surface water over private lands. Plaintiffs alleged that curbs and gutters installed in street improvements in the area caused channelling of surface water onto their land, making it unfit for habitation. The lower court entered a nonsuit. On appeal, the supreme court held that in order to state a cause of action under the statute there must be sufficient facts pleaded to show a demand and a failure to provide the requested drainage. No negligence in the usual sense need be shown; the statute, however, does not make the city an insurer against surface water damage. Furthermore, the court held that certain questions of fact should have gone to the jury. The questions included whether the overflow was due to construction of drainage facilities and whether the actions taken by plaintiffs were sufficient to constitute demand under the statute. The court reversed the lower court and remanded for a new trial. (Harris-Fla)

W69-06361

provement. The construction of a public work must, of necessity, cause inconvenience to some. The plaintiffs' lands were subject only to doubtful or occasional damage; therefore, the trial court's judgment for the defendants was affirmed. (Stewart-Fla)

W69-06363

UNITED STATES V INGRAM (BRIDGE CONSTRUCTION AND RIPARIAN OBLIGATIONS).

99 F Supp 465-474 (E D Ark 1951).

Descriptors: *Arkansas, *Legislation, *Bridges, *Operation and maintenance, Railroads, United States, Engineering structures, Navigable rivers, Navigable waters, Federal government, Right-of-way, Access routes, Highway relocation, Easements, Jurisdiction, Judicial decisions, Legal aspects, Streams, Remedies, Damages, Mississippi River.

The United States brought this action against the defendant county judge and others to enjoin dismantling of roadways and traffic approaches attached to a railroad bridge across the Mississippi River. The bridge was constructed under a special act of Congress, which conditioned authorization upon agreement by the defendant bridge company that it would construct and maintain the roadway and traffic approaches. A subsequent amendment to this act provided that the bridge company could transfer the bridge and that upon such transfer it would cease to be liable for maintenance of the roadways. The court dismissed the complaint as to the bridge company noting that the transfer to defendant county relieved the bridge company of any liability. The court found that the county did not assume the duty to maintain the roadway and was not required by statute to do so. The plaintiff's contention that the defendants had failed to comply with the Bridge Act of 1906 was found to be without merit since that act only applies to actions which affect the navigability of the river and not to actions concerned merely with highway maintenance. (Katz-Fla)

W69-06364

CITY OF IRVINE V SMITH (FLOODING CAUSED BY BREAK IN SEWER).

304 Ky 868, 202 SW 2d 733-735 (1947).

Descriptors: *Kentucky, *Sewers, *Cities, *Tile drainage, Sewage disposal, Flooding, Flood damage, Roads, Subsurface drainage, Pipes, Drainage systems, Ravines, Culverts, Floods, Legal aspects, Judicial decisions, Public benefits, Public rights, Road construction.

Identifiers: *Public sewers, *Private sewers.

Plaintiffs brought action against a city for damages caused by a break in a sewer line which flooded plaintiffs' basement. Before streets in plaintiffs' section of the city were constructed, plaintiffs' predecessors in title laid tiling in a ravine which crossed their lots; they then filled in the ravine and built a house on the lot. When streets were constructed, the city put culverts under the roadway. These culverts were connected with the private sewer lines under plaintiffs' property. The trial court awarded plaintiffs \$500 damages, and the city appealed. The court noted the mere fact that the culverts and sewers constructed by the city were connected with the private sewers under plaintiffs' property did not indicate a dedication of the private sewer for public use. Furthermore, the fact that the city sought to work out an agreement relative to the reconstruction of the private sewer line, and the fact that the city had made repairs on the private sewer did not constitute a dedication to public use. Therefore, the court concluded that since the evidence showed the sewer in question was a private sewer, and not a public sewer for which the city was responsible, the judgment should be reversed. (Reed-Fla)

W69-06365

Control of Water on the Surface—Group 4A

MARINE AIR WAYS, INC V STATE (DEPRIVATION OF ACCESS ROUTES DUE TO BRIDGE CONSTRUCTION).

116 NYS 2d 778-779 (Appladiv 1952).

Descriptors: *New York, *Riparian rights, *Access routes, *Navigation, Bridges, Compensation, Boating, Judicial decisions, Navigable waters, Relative rights, Public benefits, State governments, Damages, Legal aspects, Community development, Public rights, High water mark.

Identifiers: Navigational servitudes.

Plaintiff sought compensation for his loss of business occasioned by the state's construction of a bridge. The bridge prevented ships with masts over 50 feet from reaching his shipyard. The bridge was constructed for highway use over a navigable stream. Clearance was 50 feet over mean high water, and the average height of the masts on the ships serviced by the plaintiff was 53-55 feet. After the construction of the bridge, these ships were either unable to reach the plaintiff's yard or had to lower or remove their masts to do so. This court affirmed a judgment dismissing the plaintiff's claim. The fact that some ships could no longer reach the plaintiff's yard because of the bridge did not constitute such an interference with the plaintiff's right of access to navigable waters as would entitle him, as a riparian owner, to compensation from the state. (Blunt-Fla)

W69-06366

MCCAUSLAND V JARRELL (OBSTRUCTION OF THE FLOW OF A NATURAL STREAM).

68 SE 2d 729-746 (W Va 1951).

Descriptors: *West Virginia, *Natural streams, *Surface water, *Obstruction to flow, Drainage, Alteration of flow, Barriers, Culverts, Diversion, Natural flow doctrine, Riparian rights, Riddance (Legal aspects), Streamflow, Streams, Ditches, Drains, Running waters, Watercourses (Legal), Artificial watercourses, Damages, Channels, Seepage, Banks, Water rights, Repulsion (Legal aspects).

Identifiers: Injunctions (Mandatory).

The parties owned adjoining tracts of land through which flowed several branches of a stream. Prior to 1948, one branch flowed from plaintiff's land to a farm lane between the tracts where it ran into a culvert and was deposited upon defendant's land; there it accumulated in a small pond. In 1948 defendant raised the elevation of the farm lane and closed the culvert. Defendant dug a ditch along the lane to carry off the water from the stream. Plaintiff alleged that the ditch, being inadequate to carry off the natural flow of the stream, caused the water to accumulate on his land. Plaintiff sought to compel the opening of the culvert. The court held that a landowner is entitled to the unaltered flow of a natural stream through his land and to the land of a neighbor below. Therefore, a person who obstructs such a watercourse is liable to the upper owner for damages. Verdict was for the plaintiff. (Helwig-Fla)

W69-06367

MAGEE V TEXAS CONSTRUCTION CO (FLOODING ABOVE COFFER DAM).

227 La 32, 78 So 2d 500-502 (1955).

Descriptors: *Louisiana, *Flood damage, *Lumbering, *Overflow, Riparian rights, Judicial decisions, Legal aspects, Hardwood, Riparian lands, Cofferdams, Rivers, Swamps, Flooding, Damages, Obstruction to flow, Backwater, Forests, Legislation.

The construction of a coffer dam by defendant across a river, downstream from plaintiff's land, caused flooding and interfered with logging operations being conducted by plaintiff's contractor. The court found that the overflow caused no injury to plaintiff's hardwood and cypress trees, but damages

were assessed, measured by the decrease in the market price of the timber during the five month period in which the overflow continued. The court held that, under the Louisiana Civil Code, where one wrongfully inundates another's land, he is obliged to compensate the injured landowner for any damages directly and proximately caused by such inundation. (E Kelley-Fla)

W69-06368

JARVIS V CORNETT (DAMAGES CAUSED BY DIVERSION OF SURFACE WATER).

257 SW 2d 524-525 (Ky 1953).

Descriptors: *Kentucky, *Riparian rights, *Diversion, *Riddance (Legal aspects), Drainage systems, Surface waters, Surface drainage, Natural flow, Surface runoff, Drainage effects, Damages, Judicial decisions, Culverts, Drainage practices, Drains, Gutters, Ditches, Pipes, Relative rights, Alteration of flow, Artificial watercourses, Legal aspects, Repulsion (Legal aspects).

Defendants owned property adjacent to and higher than plaintiffs' land. A ditch ran along a highway and passed in front of each party's property. In order to construct a driveway for their store, defendants laid pipe in the ditch and placed fill around the pipe up to the level of their lot. Plaintiffs alleged defendants allowed this pipe to become clogged, causing water to flow onto neighboring lands. This condition persisted even though defendant dug a ditch between his lot and the adjacent property to divert water back into the roadside ditch. The court found that any water flow was a natural consequence of the low level of plaintiffs' lot. The owner of an upper estate may ditch his land to carry off surface water into natural channels, using sewers, culverts, or gutters, without liability to lower owners. He may do so even though such methods increase the flow onto the lower lands, but only as long as he does not tap water from additional watersheds or divert water from natural drains which otherwise would not have flowed onto the lower estate. Evidence failed to show that defendant caused an unnatural flow of surface water onto plaintiffs' land. (Kelly-Fla)

W69-06369

GRANGER V ELM TREE VILLAGE (DISCHARGE OF EXCESS SURFACE WATER).

23 NJ Super 592, 93 A 2d 641-644 (1952).

Descriptors: *New Jersey, *Repulsion (Legal aspects), *Drainage water, *Surface runoff, Judicial decisions, Boundaries (Property), Riddance (Legal aspects), Reasonable use, Drainage, Natural streams, Artificial watercourses, Surface drainage, Construction, Damages, Embankments, Retaining walls, Bulkheads, Diversion, Obstruction to flow, Land use, Natural flow.

Plaintiff owns land adjacent to defendant contractor. Prior to construction upon defendant's land, plaintiff's land was higher in elevation, and surface water drained toward and onto defendant's land. Defendant erected houses, a concrete retaining wall, an embankment and road, and raised the level of his land above that of the plaintiff. This construction caused the natural flow of water to be changed resulting in flooding of plaintiff's land. Plaintiff sought damages and a restraining order to prevent defendant from causing water to flow onto his property. The court held that a retaining wall erected 2 feet inside the property line rather than on the line did not result in unlawful collection of water on the land. To the argument that defendant had unlawfully obstructed a natural watercourse, the court replied that the evidence failed to show the water involved was anything but surface water. Defendant made reasonable use of his land, and the court refused to modify the common enemy rule so as to require that one who discharges water from his land not cause unnecessary injury to others. (Helwig-Fla)

W69-06370

DE PIETRO V TRIANO (ESTABLISHMENT OF EASEMENT FOR SURFACE WATER DRAINAGE).

167 Pa Super 29, 74 A 2d 710-712 (1950).

Descriptors: *Pennsylvania, *Easements, *Repulsion (Legal aspects), *Surface runoff, Judicial decisions, Legal aspects, Drainage, Ditches, Boundaries (Property), Natural flow, Riddance (Legal aspects), Diversion, Reasonable use, Artificial watercourses, Water law, Water rights, Land use, Surface drainage, Real property, Obstruction to flow, Walls barriers, Discharge (Water).

The parties were adjacent landowners. Appellants owned the upper tract. Prior to the time of purchase, both parties were tenants on the same land. During this period, appellant's father dug a ditch which diverted the surface water from its natural course. After the parties purchased their respective lots, appellees built a wall across the ditch which obstructed the flow of water. Appellants alleged that they had an implied easement to discharge water into the ditch because the ditch was built with the consent and by direction of the parties' common grantor. The court held that the appellant had failed to establish the existence of an implied easement. An upper landowner has a right to discharge water on lower lands by natural means. However, the upper owner may not alter the course or volume by artificial means. If artificial means are used to divert or increase the flow, an easement must first be established. The burden is on the party claiming existence of the easement to show separation of title, intent to make easement permanent, the necessity of the easement to enjoyment of land and a continuous and self-acting servitude. Appellant failed to prove these elements. (Helwig-Fla)

W69-06371

EFNER V KETTERINGHAM (VALIDITY OF EASEMENT TO DRAIN RAIN WATER ONTO ADJOINING LAND).

41 So 2d 130-136 (La Ct App 1949).

Descriptors: *Louisiana, *Easements, *Drains, *Surface runoff, Judicial decisions, Legal aspects, Damages, Seepage, Drainage effects, Flooding, Drainage systems, Paving, Pipes, Storm drains, Tiles, Conduits, Rain, Rain water, Land tenure, Drainage engineering, Relative rights.

Identifiers: Injunction (Prohibitory), Equitable servitudes.

Plaintiff brought suit for recognition of a servitude of drip and drain and to enjoin the defendants from damaging and dislocating his downspouts which discharged rain water on the defendants' driveway. The trial court held in favor of the defendants, but the court of appeals reversed on condition that the plaintiff repair and restore the defendants' driveway. The rain water from the plaintiff's roof was flooding defendants' basement. Plaintiff had originally owned both lots and had installed the downspouts from his roof to the driveway which he had constructed on the other lot. The appellate court held that the drip and drain servitude still existed even though it was not mentioned in the deed conveying the lot upon which the drive way was located. (Watson-Fla)

W69-06372

DIXON V CITY OF NASHVILLE (DAMAGES CAUSED BY DEFLECTION OF SURFACE WATER FLOW).

203 SW 2d 178-182 (Tenn 1946).

Descriptors: *Tennessee, *Surface drainage, *Road construction, *Absorption, Judicial decisions, Legal aspects, Drainage, Furrow drainage, Drainage water, Deflection, Surface runoff, Surface waters, Gullies, Runoff, Repulsion (Legal aspects), Cities, Grading, Natural flow, Erosion, Flood damage.

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

Plaintiffs sued to recover for property damage caused by interference with the natural drainage of surface waters by reason of its mode of construction and drainage of streets. The court, finding that the damage had been caused by deflection and concentration of water into a drain emptying adjacent to plaintiffs' property, rendered decision for the plaintiffs. The court noted that a city may improve its property in any natural and ordinary way so long as there is no substantial change in the flow of surface waters. The court also quoted an earlier case holding that Tennessee was not a 'common enemy' state. Therefore, when disposing of surface water, the rights of adjoining owners must be respected. (Logan-Fla)
W69-06373

JOHNSON V CITY OF WINSTON-SALEM (SURFACE WATER DRAINAGE - PIPES).

239 NC 697, 81 SE 2d 153-161 (1954).

Descriptors: *North Carolina, *Flooding, *Repulsion (Legal aspects), *Riddance (Legal aspects), Drainage water, Surface waters, Surface runoff, Storm runoff, Excessive precipitation, Drainage systems, Tiles, Pipes, Cities, Easements, Judicial decisions, Legal aspects, Remedies, Local governments, Flood damage, Conduits.

Plaintiff brought suit to recover damages caused by defendants' negligent failure to maintain a drainage pipe. The plaintiff alleged that defendant landowner was under a legal duty to maintain the drain pipe and that flood damage to plaintiff's residence was caused by clogging of the pipe and overflow of drainage waters onto defendant's upper land and then onto plaintiff's land. The plaintiff alternatively attempted to prove that the defendant city had assumed control over the pipe and had been negligent in failing to maintain the pipe. The defendant landowner contended that the pipe merely channeled the normal surface flow of water onto plaintiff's servient estate, causing no damage other than that which would normally have occurred. The court held that defendant landowner was under a legal duty to exercise ordinary care in maintenance of the ditch and that the evidence was sufficient to raise issues of fact. The court found, however, that plaintiff had failed to state a cause of action against the city since he had not established sufficient incorporation of the drain into the city's drainage system. (Katz-Fla)
W69-06374

HORN V BRATTON (SUIT TO ENJOIN MAINTENANCE OF DAM AND DITCH FACILITIES).

216 SW 2d 794-795 (Ark 1949).

Descriptors: *Arkansas, *Dams, *Ditches, *Alteration of flow, Judicial decisions, Adjudication procedure, Legal aspects, Natural flow, Ponds, Drainage, Roads, Rain, Relative rights, Diversion structures, Diversion.

Identifiers: Injunctions (Mandatory), Injunctions (Prohibitory), Testimonial proof, Expert witnesses.

Plaintiff sought to enjoin the defendant from constructing a dam and to compel him to fill a ditch on the ground that these structures would divert the natural flow of water onto the plaintiff's land. The trial court held for the defendant, and the supreme court affirmed, stating that the evidence presented supported the lower court's determination that the dam and ditch would not cast water onto the plaintiff's land. The evidence referred to was primarily the testimony of the representative of the Federal Soil Conservation Service who designed the dam and ditch facilities. (Watson-Fla)
W69-06375

NATIONAL MFG CO V UNITED STATES (SOVEREIGN IMMUNITY FROM SUIT FOR FLOOD DAMAGE).

210 F 2d 263-280 (8th Cir 1954).

Descriptors: *Missouri, *Federal government, *Flood forecasting, *Flood damage, Legislation, Flood control, Flood protection, Hurricane flood, Maximum probable flood, Rivers, River forecasting, Flash floods, Warning systems, Navigable rivers, United States, Judicial decisions, Weather forecasting, Damages, Riparian land, Riparian waters, Legal aspects, Mississippi River.
Identifiers: Kansas River, Federal Tort Claims Act, Sovereign immunity.

Plaintiffs owned businesses on land along the Kansas River. The land was inundated by flood waters from the river causing extensive damage. Plaintiffs brought suit against the United States under the Federal Tort Claims Act for damages caused by the government's negligent failure to assemble, analyze, and distribute weather and flood information. Agent's of the United States had assured plaintiffs that the river would not overflow its banks. Plaintiffs alleged that, because of the negligent acts and omissions of defendant, they were lulled into a false sense of security and did not take precautions against the flood. A motion for summary judgment for defendant was sustained in the trial court. Plaintiff appealed. Defendant asserted that the Mississippi River Flood Control Act of 1928 declares that the United States shall not be liable for damage from floods; the Federal Tort Claims does not exempt any person or situation from this exclusionary provision. The court held that the Act meant to protect the government from liability from floods whether or not sovereign immunity could be asserted. Since the Flood Control Act was not expressly repealed by the Federal Tort Claims Act and since repeals by implication are not favored, it cannot be said that the Act was impliedly repealed. (Helwig-Fla)
W69-06376

CROSS V PACE (DAMAGE TO UNITED STATES CITIZENS BY FOREIGN DAM).

106 F Supp 484-489 (DDC 1952).

Descriptors: *St Lawrence River, *International law, *Dams, *Federal government, Damages, Backwater, Floods, Lake Ontario, Legislation, Federal jurisdiction, Judicial decisions, Political aspects, Remedies, Rivers, Water levels, Foreign waters, Administration, Governments, Flood damage.

Identifiers: *Canada, *Injunctions (Mandatory), *Constitutionality, Political questions, Commerce power, Standing.

United States citizens claimed damages due to the rising level of Lake Ontario caused by a dam on the St Lawrence River. The dam was situated partly in the United States and partly in Canada. The United States gave consent to the construction of the dam, provided the structure did not injure United States interests or the interests of its citizens. Plaintiffs alleged that defendant Secretary of the Army was derelict in his duty, that the dam was illegal, and that the enabling act by which conditional consent was given was unconstitutional. Plaintiff's sought a mandatory injunction ordering alteration of the dam in such a manner as to lower the level of Lake Ontario and, in addition, sought a declaratory judgment as to their respective rights. The district court held that defendant Secretary had discretion to determine whether to invoke conditions under the act since the decision whether to right the present wrong was a political one. The court held that it was without jurisdiction to issue an injunction and that plaintiffs lacked standing to institute the action. The court held that the enabling act was an exercise of Congress' power to regulate commerce with foreign nations and that that power includes control of navigable waters. Further, the enabling act was a manifestation of legislative consent to the construction of the dam. (Harris-Fla)
W69-06380

KRAFT V MILLER (ARTIFICIAL CONTROL OF SURFACE WATERS).

314 Mich 390, 22 NW 2d 857-862 (1946).

Descriptors: *Michigan, *Dams, *Powerplants, *Dam construction, Judicial decisions, Surface waters, Natural flow, River flow, Running waters, Watercourses, Prescriptive rights, Dam design, Flood damage, Flood control, Excess precipitation, Legal aspects, Relative rights.
Identifiers: Injunctions (Prohibitory).

Plaintiffs brought suit to enjoin defendants from increasing the height of a dam. The defendants own property and a power plant about six miles downstream from the plaintiffs' property. Increasing the dam height by 3 feet will enable the defendants to produce more electric power. The plaintiffs contend that increasing the height will cause a backup of water which will damage their property. The defendants contended that any damage to the plaintiffs' land was caused by unusual rainfall and floods. After careful consideration of facts and conditions, the court held that no substantial damage had been or will be done by raising the height of the dam an additional three feet. The injunction was denied. (Stewart-Fla)
W69-06400

STATE V SENSENBRENNER (RIPARIAN RIGHTS REGARDING NATURAL DAMS).

262 Wis 118, 53 NW 2d 773-776 (1952).

Descriptors: *Wisconsin, *Navigable waters, *Dams, *Riparian rights, Beavers, Obstruction to flow, Judicial decisions, Land tenure, Natural streams, Riparian land, Natural flow, Administrative agencies, State governments, Abatement, Water level fluctuations, Dam construction, Damages, Lakes, Backwater, Legal aspects, Relative rights.
Identifiers: Penalties (Civil).

Plaintiff brought suit to recover penalties for alleged obstruction of a navigable stream. Defendant was the riparian owner of land on both sides of the navigable stream. The stream had been obstructed by a beaver dam which caused lake waters to back up onto adjacent property. Defendant refused to allow conservation commission employees to enter his lands to destroy the dam. Plaintiff contended that defendant's refusal to grant permission constituted an affirmative act to maintain the dam. The court held that the defendant had a legal right to refuse permission. No permission would be required if plaintiff's employees had come by boat and destroyed the dam. In the absence of an affirmative act of maintenance by the defendant, plaintiff had no right to force him to remove the dam. Plaintiff had inherent power to destroy the structure provided it did not seek to accomplish this objective by trespassing upon lands of the defendant. (Stewart-Fla)
W69-06401

NATURAL RESOURCES.

Minn Stat Ann secs 86.01 to 86.12, 86.31 to 86.35, 86.71, 86.75 (1964).

Descriptors: *Minnesota, *Natural resources, *Conservation, *Appropriations, Legislation, Recreation, Multiple purpose projects, Industries, Land resources, Economics, Forests, State governments, Parks, Federal government, Wildlife, Land use, Algae, Vegetation, Public lands, Public benefits, Legal aspects, Data collections, Administrative agencies, State governments, Local governments.

The Natural Resources and Recreation Act of 1963 provides the legislature with the power to evaluate programs designed to preserve, develop and maintain natural resources. A 14 member Minnesota Resources Commission is created. This agency is

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given the following duties: (1) to study the state policy and system of public access, fees, permits and use of recreational facilities; (2) to study the control of noxious aquatic vegetation; (3) to report its findings and recommendations to the legislature; (4) to conduct public hearings to secure data; (5) to investigate the feasibility of land exchanges with the federal government; and (6) to study the timber cutting policy of the state. The Commission must recognize the importance of and plan for the multiple use of natural resources. The Commissioner of Conservation is authorized to employ needy persons in distressed areas on projects for the conservation of natural resources. Money from the Federal Land and Water Fund shall be applied for, accepted and disbursed by the governor or his designated agent. Such funds shall be expended only according to law. Appropriations to local governmental units from the State Natural Resources Fund shall be first reviewed by the local officials and may be expended according to law. (Helwig-Fla)
W69-06403

4B. Groundwater Management

THE ROLE OF GROUNDWATER IN THE DEVELOPMENT OF WATER RESOURCES,
Water Planning for Israel Ltd., Tel Aviv. Research Dept.

Yona Kahana.

Int Conf on Water for Peace, Wash, DC, Vol 2, pp 809-820, 1968. 12 p, 2 ref. For the 8 Volume Proceedings see Vol 2, No 9, Field 06B and W69-03305.

Descriptors: *Water management (Applied), *Groundwater, *Arid lands, Aquifers, Systems analysis, Computers, Operations research, Artificial recharge, Water demand, Water distribution (Applied), Water resources, Watershed management, Water utilization, Storage.

Identifiers: *Groundwater management, Comprehensive water plans, Israel.

Groundwater is now generally accepted as a source of water supply; under favorable conditions it may prove to be more economical than surface water, and aquifers may be used for major storage. A groundwater system offers the advantage of equilibrium created by long-term climatic cycles. Development is possible beyond the natural recharge, thus permitting the postponement of decisions which require long periods for planning. Study of the aquifer can be continued to improve estimates while water is withdrawn. Groundwater permits flexible planning, and lends itself conveniently to development by stages. It is possible to supply groundwater to many scattered localities with no need for costly distribution systems, and to provide wells for peak demand. Aquifers can effectively serve as sources of water, conduits, reservoirs, and media for improving water quality. In arid zones, underground storage with little or no evaporation losses may be of great value; therefore, it would be preferable in many cases, particularly in arid regions, to start developing groundwater even where river water is available. Later, the aquifer may be recharged by floodwater, reclaimed sewage, or even brackish water. The need for a master plan is imperative at as early a stage of development as possible, and it will be in the process of constant re-evaluation. Operations research, the use of analogs, and computers, promise to improve management plans. (Knapp-USGS)
W69-06054

GEOLOGIC STUDIES AS AN AID TO GROUND-WATER MANAGEMENT,
Illinois State Geological Survey, Urbana.

Ronald A. Landon.

Ill State Geol Surv Environ Geol Note No 14, May 1967. 9 p, 2 fig, 7 ref.

Descriptors: *Hydrogeology, *Artificial recharge, *Illinois, Geophysics, Logging (Recording), Surveys, Boreholes, Maps, Water wells, Water management (Applied).
Identifiers: Chicago (Ill).

A preliminary geologic evaluation of an area where management of groundwater resources is contemplated can be made from existing maps, water well logs, and engineering borings relating to the region. Based on criteria established by the Illinois State Water Survey, geologic studies have been made in northeastern Illinois of the possibilities for natural and artificial groundwater recharge in the Chicago region. Similar studies can be made elsewhere with such criteria where there is available geologic control. (Knapp-USGS)
W69-06082

USE OF GRAVITY SHAFTS FOR GROUND WATER RECHARGE,

North Dakota State Univ., Fargo. Coll. of Civil Engineering.

Marvin T. Skodje.

J Amer Water Works Ass. Vol 61, No 5, pp 246-248, May 1969. 3 p, 1 fig, 2 tab.

Descriptors: *Artificial recharge, *Groundwater, Filtration, Sedimentation, Well filters, Pit recharge, Water management (Applied), Groundwater, Permeability.

Identifiers: Recharge shafts.

Sedimentary clogging of gravity recharge shafts filled with uniformly graded fine sands was shown by laboratory tests to occur only in the upper few miles of the shafts. Piezometer measurements of head loss and sediment deposition patterns showed constant permeability at lower levels. No air-bind losses were found. The permeability of sand size 20 was 14,400 gpd/sq ft; no. 30 sand, 4,500; and no. 40 sand, 3,400. Shafts should have coarser material at the bottom for maximum permeability and fine material at the top to trap sediments, with larger cross-section area at the top to maximize flow rates. (Knapp-USGS)
W69-06202

GROUNDWATER LEVELS AND PUMPAGE IN THE PEORIA-PEKIN AREA; ILLINOIS, 1890-1966,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 02F.
W69-06208

HYDROLOGY OF GROUNDWATER (GENERAL OUTLINE),

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 02F.
W69-06223

ESTIMATION OF GROUNDWATER RESOURCES,

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 02F.
W69-06230

H W PEERSON DRILLING CO V SCOGGINS (DEED EXCEPTIONS AND RIGHTS TO SUB-TERRANEAN WATERS).

For primary bibliographic entry see Field 06E.
W69-06312

4C. Effects on Water of Man's Non-Water Activities

VOLLRATH V WABASH RAILROAD CO. (DAMAGE DUE TO FLOOD WATER FLOW

THROUGH ARTIFICIAL EMBANKMENT CUT).

65 F Supp 766-775 (WD Mo 1946).

Descriptors: *Missouri, *Embankments, *Railroads, *Repulsion (Legal aspects), Flow augmentation, Water law, Relative rights, Flood damage, Eminent domain, Overlying proprietor, Confined water, Surface runoff, Overflow, Overland flow, Open channels, Surface waters, Channel flow, Discharge (Water), Damages, Impounded waters.
Identifiers: *Railroad embankments.

Defendant railroad, in order to prevent washing out of its tracks, made a cut in its embankment which allowed flood water to pass through the opening in a concentrated stream onto plaintiffs' land below. Prior to construction of the cut, the embankment served to impound overflow from a creek above the embankment. Plaintiffs sued for flood damages due to the concentrated flow onto their lands. The court entered judgment for plaintiffs. Flood water is considered surface water, and the court followed the Missouri modification of the common enemy doctrine. This doctrine allows an owner to cast surface waters from his land in any reasonable manner without liability for damage to a neighbor's property. However, even under the common enemy rule a landowner is liable for damages caused by impounding and discharging water in concentrated amounts. The measure of damages is an amount equal to the cost of repairing the injury caused by the concentrated flow, less the cost of the injury which would have occurred had the embankment not been present. A statute requiring openings in railroad embankments was held inapplicable since openings were required only when they would connect with a waterway. (Wheeler-Fla)
W69-06133

LYDA V TOWN OF MARION (UNAUTHORIZED DRAINAGE DITCHES HELD TAKING OF PRIVATE PROPERTY FOR PUBLIC USE).

For primary bibliographic entry see Field 06E.
W69-06169

TENNESSEE COAL, IRON AND RR V RAY (MINING OPERATION CAUSES DESTRUCTION OF WATER SUPPLY).

For primary bibliographic entry see Field 06E.
W69-06172

MAN'S INFLUENCE ON HYDROLOGICAL PHENOMENA,

Research Inst. for Water Resources Development, Budapest (Hungary).

J. Balogh, and I. Mátrai.

2nd Int Postgrad Course on Hydrol Methods for Develop Water Resources Manage, Budapest, Hung, Jan-July 1968, Manual No 14, 1968. 213 p, 51 fig, 49 tab, 28 ref.

Descriptors: *Water management (Applied), *Flood control, *River training, Artificial recharge, Irrigation, Drainage systems, Drawdown, Land management, Reservoir operation, Water demand, Watershed management, Water utilization, Water quality, Forest management, Runoff, Streamflow, Ice, Navigation, Water pollution, Urbanization, Industries, Agriculture.
Identifiers: *Textbooks, *Technical manuals.

The effects of human water-controlling activities, both intentional and accidental, including urbanization, agriculture, forestry, industry, and commerce, on the hydrologic cycle, are examined in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. Agricultural and forestry activities modify the water budgets of whole drainage basins, greatly changing runoff, precipitation, and other quantitative factors, but have relatively little effect on quality. Commercial, industrial, and urbanization activities have much less effect on quantity but may have

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major effects on water quality. Much of man's water demand must be met by use of groundwater. Water levels are declining in many areas. The effects of flood control and river training works on stream hydrology and the effect of human uses of catchment areas are discussed in detail. Water management efficiency and various management techniques are evaluated. (Knapp-USGS)
W69-06233

HOWLETT V CITY OF SOUTH NORFOLK (FLOOD DAMAGE ALLEGEDLY DUE TO STREET ELEVATION).

193 Va 564, 69 SE 2d 346-350 (1952).

Descriptors: *Virginia, *Drainage water, *Surface runoff, *Repulsion (Legal aspects), Flood damage, Storm runoff, Overland flow, Roads, Rainfall disposition, Diversion structures, Cities, Judicial decisions, Overflow, Reasonable use, Natural flow, Storm drains, Riddance (Legal aspects).

Plaintiff brought action against the city for damages allegedly caused by raising the grade of a street in front of plaintiff's residence, thereby causing surface water to flood his lot. This court, in affirming the trial court's judgment for defendant, stated that surface waters are waters which are diffused over the surface of the ground, following no defined course or channel. Surface water is considered a common enemy, and each landowner may fight it off as best he can. An exception to this right is that the landowner cannot collect the water into an artificial channel and discharge it upon the land of another to his injury. Thus, the right to obstruct the flow of surface water is modified by the rule that one must so use his own property as not to injure the rights of another. However, plaintiff failed to prove his allegation that a negligent act by the city directly or proximately caused water to overflow the curbing gutters and flood his property. Judgment for defendant was affirmed. (Reed-Fla)
W69-06308

ZIDEL V STATE (STATE LIABLE FOR EROSION CAUSED BY NEGLIGENTLY PLACED ROAD).

96 NYS 2d 330-338 (Ct Cl 1949).

Descriptors: *New York, *Riprap, *Erbankments, *Bank erosion, Judicial decisions, Creep, Damages, Cost repayment, Compensation, Retaining walls, Check structures, Reasonable use, Riparian rights, Obstruction to flow, Diversion, Legal aspects, Surface drainage, Surface runoff.

Plaintiff brought this negligence suit against the state for alleged damage to his lands caused by fill work which altered the cause of a creek. The state, while reconstructing a highway adjacent to the creek and to plaintiff's property, dumped concrete slabs into the creek bed to prevent erosion of the highway. This concrete fill caused considerable erosion of the plaintiff's land and endangered some of the structures thereon. Plaintiff built a temporary retaining wall to prevent the erosion. Although both plaintiff and defendant are riparian owners, their right to reasonable use does not include the right to obstruct the flow of the creek to the detriment of another owner. A political entity has no greater right than a private owner to discharge excess surface water upon the lands of another. The court would not allow the plaintiff to recover the estimated expense of erecting a permanent retaining wall, but did allow reimbursement for the cost of the temporary wall. This wall was constructed under the plaintiff's duty to minimize his damages. (Blunt-Fla)
W69-06314

4D. Watershed Protection

KANSAS RIVER, BONNER SPRINGS TO MOUTH, DEGRADATION OF CHANNEL, Geological Survey, Lawrence, Kans.

For primary bibliographic entry see Field 02J.

W69-06256

POWERS AND FUNCTIONS OF DEPARTMENT OF WATER RESOURCES - FLOOD CONTROL.

For primary bibliographic entry see Field 04A.

W69-06332

POLLUTION OF WATERS BY RAILROADS AND FACTORIES.

For primary bibliographic entry see Field 05G.

W69-06404

ATTORNEY GENERAL V CITY OF WOBURN (POLLUTION OF RIVER BY CITY).

For primary bibliographic entry see Field 05G.

W69-06406

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

GENERAL METHOD FOR DETERMINATION OF ORGANOPHOSPHORUS RESIDUES IN RIVER WATERS AND EFFLUENTS.

Ministry of Technology, London (England). Lab. of Government Chemist.

J. Askew, J. H. Ruzicka, and B. B. Wheals.
Analyst, Vol 94, No 1117, pp 275-283, Apr 1969. 9 p, 1 fig, 4 tab, 23 ref.

Descriptors: *Analytical techniques, *Pesticide residues, *Chemical analysis, *Chromatography, Organophosphorus pesticides, Pollutants, Effluents, Methodology.

Identifiers: *Pesticide analysis.

A general, comprehensive scheme for the extraction of organophosphorus pesticides from river waters and sewage effluents is described. The pesticides, after extraction with chloroform, are determined by gas and thin-layer chromatography. The procedure includes details of an improvement that enables all of the pesticides to be detected on thin-layer chromatoplates with a phosphorus-specific ammonium molybdate spray. The use of gel chromatography on columns of Sephadex LH 20 as an adjunct to identification is also described. (Knapp-USGS)
W69-06023

DETERMINATION OF FREE HYDROGEN CYANIDE IN RIVER WATER BY A SOLVENT-EXTRACTION METHOD.

Water Pollution Research Lab., Stevenage (England).

H. A. C. Montgomery, Deirdre K. Gardiner, and J. G. G. Gregory.
Analyst, Vol 94, No 1117, pp 284-291, Apr 1969. 8 p, 5 tab, 17 ref.

Descriptors: *Analytical techniques, *Chemical analysis, *Pollutants, *Solvent extractions, Industrial wastes, Toxicity, Chemicals, Fishkill, Water pollution effects.

Identifiers: *Cyanide analysis, Hydrogen cyanide.

A method described for the determination of undissociated hydrogen cyanide in river waters is designed to avoid disturbance of the equilibria between hydrogen cyanide, cyanide ion and complex cyanides during the determination. A small proportion of the hydrogen cyanide present is extracted by equilibrating the sample with 1, 1, 1-trichloroethane. The extracted hydrogen cyanide is then transferred into sodium pyrophosphate solution, and the determination is completed colorimetrically by a modification of the method of Bark and Higson. The effect of temperature on the extraction has been studied. Extractions can be carried out in the field, and conditions have been established for bringing extracted samples back to

the laboratory for colorimetric analysis. The method can be used in the range 0 to 2 mg of hydrogen cyanide per liter, and less than 0.01 mg per liter is detectable. Satisfactory tests have been carried out on solutions of known hydrogen cyanide content, on solutions of metallic complex cyanides and on river waters containing added cyanide. (Knapp-USGS)
W69-06024

LONGITUDINAL ESTUARINE DIFFUSION IN SAN FRANCISCO BAY, CALIFORNIA, Oregon State Univ., Corvallis; and California Univ., Berkeley.

G. Glenne, and R. E. Selleck.

Water Res, Vol 3, No 1, pp 1-20, Jan 1969. 20 p, 12 fig, 2 tab, 16 ref.

Descriptors: *Diffusion, *Estuaries, *Path of pollutants, Tracers, Salinity, Currents (Water), Dispersion, Energy transfer, Mixing, Mass transfer, Steady flow, Unsteady flow, Advection, Convection.

Identifiers: *San Francisco Bay (Cal), One-dimensional diffusion models.

The use of the concept of one-dimensional diffusion to evaluate the degree of mixing and dispersion in San Francisco Bay is discussed. Using Fick's first law and the concept of mass continuity, mixing or diffusion coefficients may be calculated using constituent concentrations, sources, and sinks, as well as the advection of the system. In San Francisco Bay, the diffusion coefficients calculated using silica as a tracer are generally similar to those calculated using chloride and vary considerably with time and location. In the northern part of the bay, advection is significant and diffusion coefficients vary as the 3/4 power of advective velocity. The one-dimensional diffusion model is generally feasible for solving steady and non-steady state constituent transport problems. (Knapp-USGS)
W69-06030

BIBLIOGRAPHY ON THERMAL POLLUTION, American Society of Civil Engineers, New York, Committee on Thermal Pollution.

For primary bibliographic entry see Field 05C.

W69-06081

LIMNOLOGICAL ORGANIC ANALYSES BY QUANTITATIVE DICHROMATE OXIDATION, Fish and Wildlife Service, Washington, D. C. Bureau of Sport Fisheries and Wildlife.

John A. Maciolek.

1962, 61 p. RR-60.

Descriptors: *Oligotrophy, *Organic matter, *Analytical techniques, *Limnology, *Water chemistry, Carbohydrates, Amino acids, California, Carbon, Chemical oxygen demand, Lakes, Lipids, Nitrogen, Nitrogen compounds, Oxidation-reduction potential, Periphyton, Proteins, Seston, Daphnia, Trout, Invertebrates.

Identifiers: Cloverleaf L (Calif), Bighorn L (Calif), Dorothy L (Calif), Edith L (Calif), Convict L (Calif), Crowley L (Calif), Sierra Nevada, Nernst equation, Abiogenesis, Alpine lakes, Carbon compounds, Fatty acids, Net plankton, Neuston, Proximate analysis, Ultimate analysis, Nucleic acids, Aphanizomenon, Gleotrichia.

Presently available methods for organic analysis of limnological samples are tedious, inaccurate, or lack sensitivity. Author adapted a procedure derived from soil chemistry by which a sample can be oxidized by dichromate in a strongly acid medium maintained at 100 deg C. Amount of dichromate reacting (determined titrimetrically as difference between initial and final quantities) is reckoned as weight of oxygen required by sample. Optimally, resistant compounds oxidize with a minimal efficiency of 95%. Oxidation serves as primary step in determination by diffusion of organic carbon (as carbon dioxide) and nitrogen (as ammonia). Author shows how estimates can be

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derived from results of such determinations for following characteristics of organic matter: caloric content, total organic matter, experimental oxygen equivalents, proximate groups (crude carbohydrate, crude protein, lipid), ultimate substituents, and carbon calorics. Described procedures require no special apparatus or complex procedures, are sensitive to as little as 0.01 mg organic matter, precise to within plus or minus 1%, and adaptable to various sample materials and to multiple simultaneous determinations. Author presents data describing total organic content, periphyton analysis, and plankton and neuston composition for various highly oligotrophic lakes. Interpretation of oxidative analyses of samples from highly reduced environments is not discussed. (Eichhorn-Wis)
W69-06093

MEASURING ESTUARINE POLLUTION,
Federal Water Pollution Control Administration, Washington, D. C. Estuarine and Oceanographic Programs Branch.
T. A. Wastler.
Oceanology Int, pp 43-45, May-June 1969. 3 p, 3 photo.

Descriptors: *Estuaries, *Estuarine environment, *Instrumentation, *Pollution identification, *Pollution abatement, Tidal waters, Mixing, Sea water, Fresh water, Shores, Water circulation, Floods, Density currents, Measurements, Sewage effluents, Temperature, Oxygen, Salinity, Algae, Mechanical equipment.
Identifiers: *Estuarine pollution.

This article describes briefly the basic elements of estuary pollutions and the common techniques used for the detection and mapping of these pollutants. In general the study shows that actual techniques of data collection in the estuarine zone must be designed to cope with the unique demands of the estuarine environment. The increasing sophistication of instrumentation and data analysis procedures, combined with the national concern about estuarine pollution, offers hope, according to the author, that a viable national basic data collection system may be developed soon to survey the coastal zones. (Gabriel-USGS)
W69-06203

QUALITY CHARACTERISTICS OF WATER RESOURCES,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 05G.
W69-06225

COBALT AS AN ESSENTIAL ELEMENT FOR BLUE-GREEN ALGAE,
Wisconsin Univ., Madison. Dept. of Botany.
Osmund Holm-Hansen, Gerald C. Gerloff, and Folke Skoog.
Physiologia Plantarum, Vol 7, pp 665-675, 1954. 3 fig, 5 tab, 8 ref.
W69-06279

Descriptors: *Cobalt, *Cyanophyta, *Essential nutrients, *Trace elements, Algae, Eutrophication, Molybdenum, Nitrogen fixation, Nuisance algae, Nutrients, Vitamins, Water pollution effects, Water pollution sources, Vitamin B.
Identifiers: *Cyanocobalamin, Algal growth, Algal nutrition, Algal physiology, Calothrix parietina, Coccochloris Peniocystis, Diplocystis aeruginosa, Nostoc muscorum, Vanadium, Vitamin B-12.

Authors, experimenting with Nostoc muscorum, demonstrated that cobalt is an essential nutrient element for this cyanophyte as well as for three additional species: nitrogen-fixing Calothrix parietina; and the non-fixers, Coccochloris Peniocystis and Diplocystis aeruginosa. In Nostoc, quantitative requirement is quite low, increases in yield and nitrogen content obtaining from cobalt concentrations from 0.002 to 0.40 micrograms/liter, the latter level ordinarily required for optimum

growth. These data and other evidence indicate that the following essentiality specifications have been met: Element has positive effect on total growth; it exerts a positive physiological effect on algae; it is not replaceable by another element; deficiency is reversible in incipient stages; and response can be demonstrated in representative number of species. There is evidence that cobalt requirement is independent of nitrogen source although it is much easier to demonstrate cobalt response in the two nitrogen fixers than in the two non-fixers, a condition which quite likely results from lower requirement in the latter. Preliminary experiments show that addition of as little as 0.075 microgram of vitamin B-12 per liter of culture eliminates requirement for added cobalt and results in optimum yield referable to added cobalt. (Eichhorn-Wis)
W69-06277

A BIOLOGICAL TEST FOR DETERMINING THE POTENTIAL PRODUCTIVITY OF WATER,
Vermont Univ., Burlington. Dept. of Zoology.
Milton Potash.
Ecology, Vol 37, No 4, pp 631-639, Oct 1956. 5 fig, 1 tab, 24 ref.

Descriptors: *Bioassay, *Primary productivity, Nutrients, Productivity, Fertilization, Farm ponds, Bioindicators, Eutrophication, Water pollution effects.

Identifiers: Nutrient availability, Algal growth, Algal growth potential.

Author presents method for determining quantitatively the nutrients available for plant growth in natural waters using a pure culture of the green alga, *Kirchneriella subsolitaria* G S West as indicator organism. Method was applied under controlled laboratory conditions to study water from two farm ponds. Water samples were collected from the ponds at approximately 2-week intervals from November 1950 to August 1951. Each time, six 500-ml samples from each pond were inoculated with *K. subsolitaria*. One sample served as a control and either sodium carbonate, calcium carbonate, diacid potassium phosphate, magnesium sulfate, or all four nutrients were added to remainder. Cell counts (Sedgwick-Rafter) were made daily, and population densities were estimated by statistical techniques. Both ponds varied seasonally in ability to support algal growth. As indicated by control cultures, nutrient content reached peaks during November-December and February. Adding sodium carbonate and diacid potassium phosphate did not stimulate growth in cultures. In both ponds, phosphate appeared limiting in winter; nitrate became limiting in March and remained so throughout summer. Pond supporting the greater actual production was shown to have lesser potential for growth as measured by bioassays. Author suggests that inverse correlation between potential and actual productivity may exist. (Uttormark-Wis)
W69-06279

RECOVERY OF ORGANICS FROM A EUTROPHIC LAKE BY THE CARBON ADSORPTION TECHNIQUE,
Wisconsin Univ., Madison. Hydraulic Lab.; and Wisconsin Univ., Madison. Water Chemistry Lab.
G. Fred Lee, Gordon W. Kumke, and Stanley L. Becker.
Int J Air Water Pollution, Vol 9, pp 69-80, 1965. 1 fig, 9 tab, 12 ref.

Descriptors: *Adsorption, *Eutrophication, *Organic compounds, *Water quality, *Water chemistry, Aromatic compounds, Bacteria, Chromatography, Columbia River, Great Lakes, Lakes, Lake Superior, Limnology, Missouri River, Odor, Organic matter, Ohio River, Protozoa, Rivers, Sediments, Taste, Water pollution sources, Wisconsin.
Identifiers: *Carbon adsorption techniques, *Recovery factors, Aliphatic compounds, Carbon alcohol extract, Carbon chloroform extract, Ex-

traction methods, Lake Mendota (Wis), National Water Quality Network, Oxygenated compounds, Vorticella.

A study has been conducted on the recovery of organic compounds from a eutrophic lake by the activated carbon adsorption technique. Lake Mendota, Wisconsin, had an average carbon chloroform extract of 197 micrograms/liter with an average carbon alcohol extract of 424 micrograms/liter. The amount of extractable organic matter was found to be dependent on the total flow and flow rate and independent of temperature. Large populations of micro-organisms were observed on the carbon surface. (Lee-Wis)
W69-06282

5B. Sources of Pollution

OXYGEN PRODUCTION AND LOSS IN A MODEL RIVER,
Texas Univ., Austin.
James M. Eller, and E. F. Gloyne.
Texas Center for Research in Water Resources, Technical Report No 1, April, 1969. Washington, D. C., 81 p, 4 tab, 16 fig, 38 ref. OWRR Project B-044-TEX.

Descriptors: *Model river, *Oxygen production, *Loss of oxygen, Photosynthetic oxygen, Pollution, Productivity.

The purpose of this study was to evaluate the formation and escape of photosynthetically produced gas bubbles. The effects of solar energy, temperature, nutrient concentration, dissolved oxygen levels, and net photosynthetic oxygen production on the magnitude of the bubble loss were investigated. The study was conducted in a model river that provided near optimum conditions for the occurrence of large bubble losses. The escaping gases were collected and analyzed for oxygen content. It was found that the bubble loss phenomenon can be a significant oxygen sink in highly productive waters, which are subject to a low velocity of flow, a high light intensity, a high water temperature, and a high dissolved oxygen saturation level. The dissolved oxygen saturation level of the water was found to be indicative of both the magnitude of bubble loss and the gas composition of the escaping bubbles.
W69-06002

LIMNOLOGICAL INVESTIGATIONS OF TEXAS IMPOUNDMENTS FOR WATER QUALITY MANAGEMENT PURPOSES - LIMNOLOGICAL AND WATER QUALITY DATA FOR THE HIGHLAND LAKES, 1968,
Texas Univ., Austin.

E. Gus Fruh, and Ernst M. Davis.
Texas Center for Research in Water Resources, Technical Project Report No 1, March, 1969. 187 p, 46 tab, 28 fig, 21 ref, 1 append. OWRR Project B-020-TEX.

Descriptors: Highland Lakes, Colorado River, Texas, *Water quality, *Limnology, *Oxygen, *Coliform bacteria, *Phytoplankton, *Limiting nutrient, *Odor problems.

A detailed limnological and water quality investigation was conducted on a chain of seven reservoirs located within a 150 mile reach of the Texas Colorado River near Austin. The morphological characteristics of each reservoir as well as its purpose in the chain affected the water quality. The presence of a thermal stratification as well as the location of the penstock in the dam controlled the water quality of the impoundment release. The most serious water quality problem was the depletion of oxygen in the lower waters of nearly all these impoundments. High numbers of total coliform were found only once in some of the reservoirs, although persistent numbers were found throughout the year in Lakes Town and Decker. The phytoplankton standing crop was small although it increased down the reservoir chain.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

From chemical measurement of the water, phosphorus or iron or nitrogen could be limiting phytoplankton growth during the summer. Lakes Austin and Town had a high odor content in the summer during or immediately after an increase in the blue-green algae.
W69-06003

STOCHASTIC MODEL FOR BOD AND DO IN STREAMS,
Virginia Polytechnic Inst., Blacksburg, Dept. of Statistics.
Richard P. Thayer, and Richard G. Krutchkoff.
ASCE Proc, J Sanit Eng Div, Vol 93, No SA3, Pap 5297, pp 59-72, June 1967. 14 p, 4 fig, 2 tab, 4 ref, 1 append. Grant No 8T1 ES33-03 (HEW).

Descriptors: *Mathematical models, *Statistical models, *Stochastic processes, *Dissolved oxygen, *Path of pollutants, Water pollution effects, Biochemical oxygen demand, Oxygen sag, Aeration.
Identifiers: *Sacramento River (Calif).

A stochastic model for pollution and dissolved oxygen in streams is presented. Given the stream parameters and the initial conditions, the model predicts not only the mean amounts of pollution and dissolved oxygen at any point downstream, but also their variability in time. It can determine the proportion of the time that pollution is above any given concentration or that dissolved oxygen is below any given concentration. The theoretical results are tested by comparing them with controlled laboratory experiments and with data from the Sacramento River. It is observed that the means of both pollution and dissolved oxygen follow the equations already obtained by Dobbins in 'BOD and Oxygen Relationships in Streams.' Journal of the Sanitary Engineering Division, ASCE, Vol. 90, No. SA3, Proc. Paper 3949, June 1964, p. 53. A new and unexpected observation is that the greatest variability in dissolved oxygen occurs at the sag, where it is most critical.
W69-06080

BIBLIOGRAPHY ON THERMAL POLLUTION,
American Society of Civil Engineers, New York, Committee on Thermal Pollution.
For primary bibliographic entry see Field 05C.
W69-06081

QUALITY CHARACTERISTICS OF WATER RESOURCES,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 05G.
W69-06225

LONG-TERM TREND ANALYSES OF WATER QUALITY-A MODEL STUDY OF THE PASSAIC RIVER BASIN,
Rutgers - The State Univ., Newark, N. J. Dept. of Environmental Science; and Geological Survey, Trenton, N. J.
Samuel D. Faust, and Peter W. Anderson.
Proc 1st Annu Colon Educ Conf on 'Boundaries of our Environ,' Nat Ass Sanit, May 1-2 1968, pp 35-45, 1968. 11 p, 4 ref.

Descriptors: *Water quality, *Water pollution, *Statistical models, *New Jersey, Municipal wastes, Industrial wastes, Dissolved oxygen, Biochemical oxygen demand, Regression analysis, Forecasting, Water pollution control.
Identifiers: Passaic River Basin (NJ).

Water-quality trends in the Passaic River Basin, New Jersey, were determined by linear regression analysis. Water quality data have been collected at 6 main stream and 10 tributary sites since 1950. The data include temperature, turbidity, color, pH, chloride, DO, coliforms, BOD, alkalinity and hardness. The basin has an area of about 950 sq mi. About 120 municipal and industrial waste

discharges enter the streams and 10 water suppliers use river water. At the end of 1967, 270 mgd were being diverted from the basin and 55 mgd of waste discharged into it. Oxygen saturation is decreasing at the rate of 1% per yr. BOD shows no distinct trend. Linear regression curves showing trends in the measured quality data are presented and used for projections of future conditions. If nothing is done to prevent it, BOD will increase to 18.7 tons/day in 1970, to 23.5 in 1980, and 33.0 in 2000, an increase of 1/2 tons per day every year. Dissolved oxygen will approach the vanishing level by 1980. Water quality management must first determine the proper quality for streams and then undertake the action necessary to achieve it. (Knapp-USGS)
W69-06235

OIL POLLUTION - A REPORT TO THE PRESIDENT.

Department of the Interior, Washington, D. C.; and Department of Transportation, Washington, D. C.

Spec Rep to the Pres By Dep of Interior and Dep of Transportation, Feb 1968. 31 p, 7 charts, 94 ref.

Descriptors: *Oil wastes, *Oily water, *Water pollution sources, *Water pollution treatment, Disasters, Water pollution control, Governments, International commissions, Legislation, Treaties, Legal aspects, Costs, Financing.
Identifiers: *Oil spill control, Oil spills.

A special report by the U.S. Departments of Interior and Transportation discusses the causes, sources, effects, handling and prevention of oil spills at sea and on inland waters. Disposal of waste oil by service stations and industrial plants is also a serious and growing problem. Present capabilities of handling spills and present international regulation of discharges on international waters are inadequate. Legal, technical, industrial, and cost aspects of prevention are discussed. Physical and legal facilities for cleanup of oil spills are described. Present action programs involving study, recommendations, regulations, enforcement, legislation, international conventions, and fiscal support are listed. (Knapp-USGS)
W69-06237

RAIN AS A SOURCE OF VITAMIN (B-12),
Washington Univ., St Louis, Mo. Dept. of Botany.
Bruce C. Parker.
Nature, Vol 219, No 5154, pp 617-618, Aug 10, 1968. 1 tab, 15 ref.

Descriptors: *Rain, *Vitamins, Algae, Bioassay, Bioindicators, Chlamydomonas, Carbon, Ecosystems, Euglena, Eutrophication, Organic matter, Phytoplankton, Primary productivity, Soil chemistry, Water chemistry, Water pollution effects, Water pollution sources.
Identifiers: *Vitamin B-12, Algal growth, Cyanocobalamin, Euglena gracilis Z, Microbiological assay, Species composition.

Forms and concentrations of vitamin B-12 in natural aquatic ecosystems are important in that they may limit primary productivity and influence the species composition of phytoplanktonic populations. Author reports studies stemming from the observation that after spring rains, phytoplanktonic Chlamydomonas became dominant organisms in small experimental ponds concomitantly with increases in their vitamin content. Rain, collected in stainless steel containers, was filtered through Millipore filters (pores, 2 microns), and assayed for vitamin B-12 microbiologically utilizing Euglena gracilis, Z strain. In nine collections taken during 13 months, concentrations ranged from negligible to 20.0 picograms/milliliter. Fragmentary evidence supports the hypothesis that vitamin originates from soil particles borne into atmosphere. Author points out that a hypothetical lake containing Euglena, and rich in all nutrients except B-12, would support growth of a million cells/square centimeter of lake surface after a rain of 1 centimeter

containing 20 picograms of vitamin/milliliter. (Eichhorn-Wis)
W69-06273

THE BIOSYNTHESIS OF VITAMINS OF THE (B-12) GROUP IN MIXED CULTURES OF BACTERIA,

Poznam Agricultural Academy (Poland). Dept. of Agricultural Technology.
Jozef Janicki, and Franciszczk Pedziwilk.
Acta Microbiologica Polonica, Vol 15, pp 343-348, 1966. 4 tab, 4 ref.

Descriptors: *Bacteria, *Cultures, *Vitamins, Aquatic microbiology, Electrophoresis, Eutrophication, Microbiology, Pseudomonas, Soil chemistry, Soil microbiology, Solvent extractions, Spectrophotometry, Water chemistry.

Identifiers: *Biosynthesis, *Vitamin B-12, *Bacillus mesentericus*, *Corrinoids*, Culture media, *Cyanocobalamin*, *Propriobacterium arabinosum* 10, *Propriobacterium freudenreichii* 3, *Propriobacterium pentosaceum* 13, *Propriobacterium shermanii* 1, *Proteus vulgaris*.

Species composition of bacterial flora synthesizing substances with activity of vitamin B-12 (cyanocobalamin) and conditions of their culture affect the composition and quantity of these substances produced. Authors outline bacteriological culture methods by which five strains of such bacteria can be cultivated and describe methods for solvent extraction of corrinoids (cyanocobalamin and analogs) from aqueous suspensions of bacteria for quantification by spectrophotometry, and for separation by electrophoresis. Mixed cultures of different bacterial species produced higher yields of corrinoids as compared with their pure cultures. In typical experiment, the following bacteria in pure culture produced (under relatively anaerobic conditions) total corrinoids indicated (in micrograms/milliliter of medium): *Propriobacterium shermanii* 1 (PS), 6.47; *P. freudenreichii* 3 (PF), 4.06; *P. arabinosum* 10 (PA), 0.98. Mixed cultures of PF+ PS produced 9.64; of PS+ PA, 7.55. In mixed cultures, composition of the corrinoids synthesized varies qualitatively, percentage corrinoids corresponding with cyanocobalamin varying between 12.4 and 47.8. Rate of synthesis of cyanocobalamin was markedly higher in aerobic conditions, although total corrinoids are reduced. Thus, PS+ *Bacillus mesentericus* yield 21.1% cobalamin in total corrinoids of 7.52 anaerobically; 47.8% of 2.50 aerobically. (Eichhorn-Wis)
W69-06274

WASTES, WATER, AND WISHFUL THINKING: THE BATTLE OF LAKE ERIE,
Case Western Reserve Univ., Cleveland.
For primary bibliographic entry see Field 05G.
W69-06305

SOUTHLAND CO V AARON (ACTION FOR POLLUTION OF DOWNSTREAM WATER SUPPLY).

For primary bibliographic entry see Field 05G.
W69-06345

MASSEY V MASONITE CORP (OVERFLOW OF EFFLUENTS INTO PRIVATE LAKE).

For primary bibliographic entry see Field 05G.
W69-06409

5C. Effects of Pollution

LIMNOLOGICAL INVESTIGATIONS OF TEXAS IMPOUNDMENTS FOR WATER QUALITY MANAGEMENT PURPOSES - THE USE OF ALGAL CULTURES TO ASSESS THE EFFECTS OF NUTRIENT ENRICHMENT ON THE HIGHLAND LAKES OF THE COLORADO RIVER, TEXAS,
Texas Univ., Austin.
Bert A. Floyd, E. Gus Fruh, and Ernst M. Davis.

Effects of Pollution—Group 5C

Texas Center for Research in Water Resources, Technical Project Report No 2, January, 1969. 45 p, 3 tab, 4 fig, 23 ref. OWRR Project B-020-TEX.

Descriptors: Highland Lakes, Colorado River, Texas, *Nutrient Enrichment Tests, *Nitrogen, *Phosphorus, *Iron, *Limnology, *Algae.

This study was an investigation of the effects of inorganic nitrogen, phosphorus, and iron on algal growth in the Highland Lakes of the Colorado River, Texas. River water from the upper and lower reaches of the reservoir system was used as media for unicellular cultures in laboratory controlled growth experiments. Differences in growth were measured between a control and samples enriched with the three nutritive substances. These measurements showed increased algal growth with the addition of nitrogen and phosphorus, but no increase with either of the three elements separately. Also, differences in growth and nutrient requirements were found between green and blue-green species. Finally, an increase in the fertility of the water as it flows through the reservoir system was noted.

W69-06004

HEATED EFFLUENTS AND EFFECTS ON AQUATIC LIFE WITH EMPHASIS ON FISHES, Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.

Edward C. Raney, and Bruce W. Menzel. Dept of the Interior, Water Resources Sci Inform Center Bibliogr Pub, Apr 1969. 470 p.

Descriptors: *Bibliographies, *Heated water, *Thermal pollution, *Water pollution effects, *Fish, Fishkill, Morbidity, Toxicity, Water quality, Eutrophication, Aquatic productivity.

A bibliography on the effects of heated effluents on aquatic life with emphasis on fishes contains references to 1870 papers. Each title is permuted and alphabetically indexed on each significant word and identified by a number which refers to a complete listing by author and title. Arrangement by key words in context (KWIC) is for the convenience of the user. (Knapp-USGS)

W69-06022

STOCHASTIC MODEL FOR BOD AND DO IN STREAMS, Virginia Polytechnic Inst., Blacksburg. Dept. of Statistics.

For primary bibliographic entry see Field 05B.

W69-06080

BIBLIOGRAPHY ON THERMAL POLLUTION, American Society of Civil Engineers, New York, Committee on Thermal Pollution.

H. Bruce Gerber. ASCE Proc, J Sanit Eng Div, Vol 93, No SA3, Pap 5303, pp 85-113, June 1967. 29 p, 878 ref.

Descriptors: *Bibliographies, *Thermal pollution, Rivers, Lakes, Reservoirs, Water supply, Mixing, Dispersion, Diffusion, Instrumentation, Water pollution effects, Thermal stratification, Water temperature. Identifiers: Thermal pollution bibliography (1966).

The initial charge of the ASCE Committee on Thermal Pollution of the Sanitary Engineering Division was to investigate and correlate available information regarding the effect, from a sanitary engineering standpoint, of the unnatural increase or decrease of water temperature caused by the industrial use of water. The general categories of the resulting bibliography include (1) general properties of heat and heat exchange between water and atmosphere, (2) effects of heated discharges on the receiving body of water, and (3) effects of heated discharges on uses made of the receiving body of water. Categories (2) and (3) contain the greater number of articles; specifically studies on cooling ponds, water supplies, lakes and reservoirs, rivers and streams, stratified flow problems, mixing and

dispersion, instrumentation methods and devices, and effects on aquatic life. The bibliography is in alphabetic order according to the author. It is not in any order based on the classifications given above.

W69-06081

PRIMARY PRODUCTION, ENERGETICS, AND NUTRIENT UTILIZATION IN A WARM-WATER STREAM,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife. Alfred R. Grzenda, Robert C. Ball, and Niles R. Kevern.

Inst of Water Research, Red Cedar River Ser, October 1968, 80 p. TR-2.

Descriptors: *Water pollution effects, *Rivers, *Periphyton, *Streams, *Primary productivity, *Energy budget, *Cycling nutrients, Bioindicators, Biological communities, Eutrophication, Michigan, Nitrogen, Phosphorus, Photosynthesis, Plant pigments, Seasonal, Streamflow, Thermodynamics, Trophic level, Water pollution sources.

Identifiers: *Red Cedar River (Mich), Diatoma, Fragilaria, Navicula, Cocconeis, Gomphonema, Williamston (Mich), Warm water streams.

Near Williamston, Mich, the Red Cedar River receives nutrients via agricultural runoff and outfall from town's sewage plant. For year beginning July 1957, a clean-water station was sampled at a frequency (59 dates) dictated by season and flow characteristics of the stream. Information pertaining to primary production and nutrient and energy flow through the periphyton community was derived from following determinations: pH, alkalinity, turbidity, seston, optical absorbancy, phosphorus, nitrogen, periphyton biomass, and diurnal oxygen curves. Seasonal range in net, ash-free primary production (grams/square meter/day on plexiglass substrates) was 0.01-2.28 (mean: 0.56). Photosynthetic efficiencies (%) based on net production and surface radiation ranged 0.003-0.245 (mean: 0.07). Flood periods (about 31 days) accounted for 45% of total import of 16 metric tons of phosphorus. Total inorganic nitrogen imports for nine months were 84 metric tons. Flooding had less pronounced effects than in case of phosphorus, indicating that runoff is primary source of nitrogen. Utilization efficiencies (%) calculated on basis of 100 meters of stream were: total phosphorus, 0.0003-0.41; soluble phosphorus, 0.0007-0.61; inorganic nitrogen, 0.02-0.19. Ratio of phytopigment absorbancy to periphyton colony weight differentiated oligosaprobic and mesosaprobic communities with ranges 10.0-16.9 and 1.84-2.8, respectively. (Eichhorn-Wis)

W69-06092

TUTEN V SHELL OIL CO (SALT WATER DAMAGE TO LAND AND CROPS BY OIL INDUSTRY NEGLIGENCE).

26 So 2d 757-760 (Ct App La 1946).

Descriptors: *Louisiana, *Oil industry, *Saline water, *Land tenure, Damages, Levees, Flooding, Land use, Productivity, Pastures, Judicial decisions, Legal aspects, Oil wastes, Oil fields, Grazing. Identifiers: *Salt water pits, *Crop damage, Negligence.

Plaintiff filed suit to recover the sum of \$1,500 in rents allegedly lost due to the negligence of the defendant in allowing salt water to overflow plaintiff's lands as a result of oil and gas well operations in adjacent oil fields. Plaintiffs alleged that this negligence made crop development impossible for their tenant and rendered the land unfit for grazing for two years. The trial judge held for the defendant on the ground that plaintiff had not proved a negligent break in the levee surrounding the salt water pits. The court of appeal of Louisiana held that plaintiff could recover for lost rent, but that proof of the amount of damage must be more positive. The court also held that the facts showed

damage from two sources, only one of which defendant was responsible for, and that a proportional determination would be necessary. A judgment of nonsuit was ordered. (Harris-Fla)

W69-06110

MCKINNEY V DENEEN (LIABILITY FOR DISCHARGE OF MINE WASTES).

231 NC 540, 58 SE 2d 107-109 (1950).

Descriptors: *North Carolina, *Eminent domain, *Aggradation, *Streamflow, Judicial decisions, Streams, Compensation, Natural flow, Alteration of flow, Stream erosion, Riparian rights, Natural use, Water pollution, Mining, Water pollution sources, Legislation, Reasonable use, Sediment, Non-navigable waters, Mine wastes, Legal aspects, Damages.

Identifiers: Non-riparian owner, Fords, Mica, Kaolin.

Plaintiffs owned land lying in part along a non-navigable stream. A private road lead from their land across a ford in the stream to a highway. This road was plaintiffs' only ingress and egress. Defendants were non-riparians who ran a mica-washing machine on a hill upstream from plaintiffs' land. Gravel and river schist from defendants' operation were discharged in large quantities into the stream through pipes. This waste destroyed plaintiffs' ford and caused other damage to their land. Plaintiff sought damages and injunctive relief. Defendant demurred to complaint and defended on the authority of a statute authorizing persons mining mica to discharge waste water into natural watercourses. The trial court sustained the demurrer. The supreme court, reversing, held that the statute did not relieve such persons from liability for damages resulting from such discharge. Governments may restrict use of property for public good and incidental loss is not compensable, but a direct entry on, or appropriation of private property for public use does not come within such rule. (Helwig-Fla)

W69-06111

FISHERIES; CONSERVATION.

For primary bibliographic entry see Field 06E. W69-06144

OIL POLLUTION - A REPORT TO THE PRESIDENT.

Department of the Interior, Washington, D. C.; and Department of Transportation, Washington, D. C. For primary bibliographic entry see Field 05B.

W69-06237

HYDROLYSIS OF CONDENSED PHOSPHATES-I: NON-STERILE ENVIRONMENT, Wisconsin Univ., Madison. Water Chemistry Lab. For primary bibliographic entry see Field 02K. W69-06271

AGE AND GROWTH OF WHITE BASS IN ONEIDA LAKE, NEW YORK,

Cornell Univ., Ithaca, N. Y. Dept. of Conservation. John L. Forney, and Charles B. Taylor. NY Fish Game J, Vol 10, pp 194-200, 1963. 5 tab, 12 ref.

Descriptors: *Growth rates, *White bass, *Food habits, New York, Fish, Insects, Zooplankton, Amphilopoda, Crayfish, Mayflies, Competition. Identifiers: *Oneida Lake (NY), Gear selectivity, Year classes, Roccus (Morone) chrysops.

Authors describe age, growth, and food habits of white bass, Roccus (now Morone) chrysops, in moderately eutrophic Oneida Lake, New York, based on 1956 through 1961 collections. Growth of all fish except age 0+ was back-calculated; age group 0+ fish were measured directly. Food data were recorded in field as percentage of occurrence.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

Sampling gear consisted of gill nets, trap nets, shockers, trawls, and angling. Based on all gear (628 fish), calculated mean total lengths were: 5.3, 10.3, 12.3, 13.3, 14.0, 14.7, 15.4, 16.0, and 17.4 inches at annuli 1-9. Analysis by gear type indicates some bias by gear selectivity. Growth of females is more rapid than males by 0.6 to 0.8 inches at annuli 3-7. Growth of 1951-1953 year classes was somewhat more rapid than for succeeding year classes; depressed growth is thought due to intraspecific competition resulting from exceptionally large 1954 year class. Food data (322 age-1 and older fish) as percentage of occurrence are: fish, 69; insects, 94; zooplankton, 21; crayfish, 13; amphipoda, 9. Tabular data include age distributions, calculated lengths by sampling gear, lengths of age-0 fish, summary of calculated lengths, and food data by months. (Voigtländer-Wis)
W69-06275

GROWTH EQUATIONS WITH METABOLIC PARAMETERS, Bureau of Commercial Fisheries, La Jolla, Calif. Biological Lab. Clyde C. Taylor. J Cons Int Explor Mer, Vol 27, pp 270-286, 1962. 10 fig, 41 ref.

Descriptors: *Growth rates, *Fish, *Metabolism, Equations, Rainbow trout, Length, Statistical methods, Statistical models, Estimating equations, Fish physiology.

Identifiers: *Growth equations, *von Bertalanffy, *Growth models, Exponential growth, Ford-Walford regression, Parker-Larkin equation, Compensatory growth, *Acipenser fulvescens*, *Salmo gairdneri*, *Salvelinus alpinus*.

Analyses of fish growth patterns may prove useful in determining environmental effects on growth. Growth equation commonly used in fisheries studies is von Bertalanffy's: $dw/dt = Hs - kw$, where dw/dt = weight increase/unit time, H = weight synthesized/unit surface area, s = total surface area, k = tissue destruction/unit weight, and w = total weight. Author calculates a and b in relationships: $\log s = \log p + a \log L$ and $\log w = \log q + b \log L$, where L = fish length; p and q = proportionality constants, and a and b are not equal to the commonly assumed values 2 and 3, respectively. Examples include: $a = b$, a greater than b , b greater than a , and $b - a = 1$. Data treatments indicate that appropriate exponents of L are necessary in Ford-Walford regression, L -sub- $(t+1)$ = m (L -sub- t)+ i , to obtain good fit with data. Here, L -sub- t and L -sub- $(t+1)$ are lengths at time t , and at subsequent unit incremental time; and m and i are slope and intercept, respectively. Exponents determined from trial equations permit comparing estimated maximum lengths and maximum ages with observed values. Author applied analysis to growth data for four species. Surface area-weight-metabolism relationships, compensatory growth, and validity of von Bertalanffy theory are briefly discussed. (Voigtländer-Wis)
W69-06280

THE GROWTH RATE OF MICROORGANISMS AS A FUNCTION OF SUBSTRATE CONCENTRATION, Microbiological Research Establishment, Salisbury (England). E. O. Powell, C. G. T. Evans, R. E. Strange, and D. W. Tempest. 3rd Int Symp. Microbiol Physiology and Continuous Culture, Her Majesty's Stationery Office, pp 34-55, 1967. 6 fig, 1 tab, 35 ref.

Descriptors: *Growth rates, *Kinetics, *Microorganisms, Mathematical models, Mathematical studies, Eutrophication, Theoretical analysis, Diffusion, Permeability, Metabolism, Least squares method, Phosphates, Amino acids, Carbohydrates. Identifiers: *Substrate-limited growth, *Chemostats, *Continuous culture, Kinetic theory, Growth kinetics, Microbial kinetics, Microbial nutrition, Microbial physiology, Microbial growth,

Endogenous metabolism, *Escherichia coli*, *Aerobacter aerogenes*, *Nitrosomonas*, *Mycobacterium tuberculosis*, Glucose, Lactose, Mannitol, Arginine, Tryptophane, Monod's equation, Teissier's equation, Moser's equation.

The present-day theories of continuous culture are reviewed in detail with emphasis on the functional relationship between growth rate and substrate concentration under steady-state conditions. The equations of Monod, Moser and Teissier are discussed and compared to a relationship based on the theories of diffusion and permeability developed by the author. The effects of endogenous metabolism and low viability are investigated and it is shown that both effects can be represented (very closely) by the same equation. In cultures where both factors operate, the influence of endogenous metabolism is exhibited at growth rates much above those at which viability is reduced. The equations developed by Monod, Teissier, and the author are fitted to 13 sets of published data by the method of least-squares. Monod's equations gave the poorest fit in 10 of 13 comparisons, indicating that the rectangular hyperbola approaches its asymptote too slowly to represent the observations well. In 9 comparisons the equations of the author were superior to the rest, which suggests that corrections for diffusion and permeability may be significant. (Uttormark-Wis)
W69-06281

HYDROLYSIS OF CONDENSED PHOSPHATES-II: STERILE ENVIRONMENT, Wisconsin Univ., Madison. Water Chemistry Lab. For primary bibliographic entry see Field 02K. W69-06284

SOURCES OF ELEMENTAL NITROGEN IN FERMENTATION GASES, Wisconsin Univ., Madison. Water Chemistry Lab. Patrick L. Brezonik, and G. Fred Lee. Air Water Pollution Int J, Vol 10, pp 145-160, 1966. 4 fig, 4 tab, 32 ref.

Descriptors: *Fermentation, *Nitrogen, Activated sludge, Amino acids, Ammonia, Anaerobic digestion, Analytical techniques, Bacteria, Chemical analysis, Denitrification, Gas chromatography, Hypolimnia, Lakes, Nitrates, Nitrites, Nitrogen cycle, Nitrogen compounds, Sewage treatment, Sludge, Water chemistry, Wisconsin.

Identifiers: *Fermentation gases, Madison (Wis), Mass spectrometry, Nine Springs Sewage Treatment Plant, Nitrate-nitrogen, Nitrogen-15, Van Slyke reaction.

An investigation was conducted on the sources of elemental nitrogen gas in biogenic gases resulting from the anaerobic fermentation of sewage sludge. Gas chromatographic and mass spectrometric studies using labelled (N-15) ammonia showed that nitrogen gas is not produced by any mechanism other than bacterial denitrification of nitrate. The addition of nitrate-nitrogen to anaerobically fermenting sludge resulted in an approximate 50% conversion of its nitrogen to nitrogen gas. The non-enzymatic (Van Slyke) reaction for the conversion of nitrite, ammonia, and amino acids to nitrogen was found only in solutions with a pH less than 3. Studies on activated sludge showed that denitrification took place under anoxic conditions. Nitrate inhibition of methane production in sewage digester sludge was found to be small at 10 ppm of nitrate-nitrogen and virtually complete at 50 ppm nitrate-nitrogen. (Lee-Wis)
W69-06285

ENVIRONMENTAL IMPACT OF BRINE EFFLUENTS ON GULF OF CALIFORNIA, Arizona Univ., Tucson. D. A. Thomson, A. R. Mead, and J. R. Schriber, Jr. Office of Saline Water, Research and Development Progress Report No. 387, March 1969. 196 p. OSW-14-01-0001-1665

Descriptors: *Brine disposal, *Brines, *Saline water, Water pollution, Waste disposal, Thermal pollution, Effluents, Estuaries, Gulf, Oceanography, Outlets, Desalination, Hydrology, Hydrologic data.

Identifiers: *Marine ecology, Gulf of California.

Available literature has been reviewed for the purpose of determining the possible effect of introducing large volumes of brine effluent from large size desalting plants on the marine ecology of the Gulf of California. Data on the climatology of the northern Gulf region, the temperature, salinity and dissolved oxygen content of the Gulf waters, and the tides and tidal currents were summarized from existing reports. Heat budget calculations were made to show annual mean temperature increases above ambient values resulting from the mixing of effluent with sea water. The extent of the biological effect on the environment was assessed from assumed degree of mixing with respect to diffusing the effluent in sea water to mining thermal and salinity gradients. (Rinne-Office of Saline Water) W69-06287

BRIGGS V CITY OF VIROQUA (SEWAGE DISCHARGE ACROSS LAND).

264 Wis 47, 58 NW 2d 546-553 (1953).

Descriptors: *Wisconsin, *Cities, *Municipal wastes, *Sewage effluents, Damages, Sewage, Domestic wastes, Sewage treatment, Legal aspects, Judicial decisions, Property values, Odor, Storm runoff, Eminent domain, Condemnation, Remedies.

Identifiers: *Injunctions (Permanent), Injunctions (Prohibitory).

Defendant municipality allowed effluent from a sewage disposal plant to be discharged so as to establish a permanent stream across plaintiffs' land. This discharge created a condition which rendered erosion damage from storm runoff more likely to occur. Such erosion damage had not occurred when the land was dry. The plant was designed to allow raw sewage to flow directly across plaintiffs' land during heavy rains. Plaintiffs, after repeated complaints to the city, brought action to abate the nuisance and to recover damages for injury to land as a result of such nuisance. The trial court awarded damages but denied injunctive relief. The appellate court affirmed the damage award and granted a permanent injunction restraining the city from allowing sewage to flow over plaintiffs' land if such sewage was not treated so as to remove foul or noxious matter. The court held that a municipality has no right to create a private nuisance. Furthermore, it noted that plaintiffs' remedies were not confined to eminent domain proceedings; an injunction was proper even though damages were awarded for diminution in land value. (Wheeler-Fla)
W69-06355

VEAZIE V CITY OF DURHAM (PERMANENT DAMAGES RESULTING FROM MUNICIPAL SEWAGE DISCHARGE).

59 SE 2d 429-430 (NC 1950).

Descriptors: *North Carolina, *Sewage, *Water pollution, *Municipal wastes, Effluents, Legislation, Cities, Impaired water quality, Water pollution effects, Waste water (Pollution), Water law, Judicial decisions, Domestic wastes, Streams, Water supply, Damages, Sewage treatment, Remedies, Legal aspects, Public rights, Public benefits.

Identifiers: *Injunctions (Prohibitory).

Plaintiff was awarded permanent damages for injury to his land caused by the discharge of sewage into streams flowing through the property. The lower court also required the city to remedy the conditions found to constitute a nuisance, to refrain from discharging raw sewage into the streams, and to repair certain disposal facilities.

The appellate court affirmed the lower court and in denying a petition for rehearing, held that the award of permanent damages was proper. It noted that upon payment of such damages the defendant would acquire a permanent right to operate its present sewage disposal plant so long as it was kept in proper repair. The court further ruled that the prohibition against discharge of raw sewage was proper since that portion of the judgment was designed to prevent future injury to plaintiff. The court also cited a state statute which forbids the discharge of raw sewage into rivers from which a public drinking water supply is taken when the point of such taking is below the point of discharge. (Wheeler-Fla) W69-06356

5D. Waste Treatment Processes

LIMNOLOGICAL INVESTIGATIONS OF TEXAS IMPOUNDMENTS FOR WATER QUALITY MANAGEMENT PURPOSES - THE DISTRIBUTION OF COLIFORM BACTERIA IN STRATIFIED IMPOUNDMENT, Texas Univ., Austin.

Alan C. Gravel, E. Gus Fruh, and Ernst M. Davis. Texas Center for Research in Water Resources, Technical Project Report No 3, February, 1969. 92 p, 4 tab, 8 fig, 44 ref, 5 append. OWRR Project B-020-TEX.

Descriptors: *Stratified impoundments, *Coliform dieoff rate, *Wastewater treatment, *Temperature, *Dissolved oxygen, *pH.

The distribution of coliform bacteria in stratified impoundments was studied in an attempt to define the characteristics and causes for that distribution. A field sampling program was conducted to validate data in the literature which indicated that coliform densities were higher in hypolimnion than in epilimnion waters. The literature was reviewed and laboratory research conducted to evaluate the hypothesis that this coliform stratification was due to differences in death rates resulting from stratification of temperature, pH, and dissolved oxygen. Results showed this hypothesis to be a satisfactory explanation and indicated that differences in temperature and pH were most important. W69-06005

NITROGEN REMOVAL FROM NATURAL WATERS, New Mexico State Univ., Las Cruces. Engineering Experiment Station.

R. E. Speece, and R. G. Montgomery. Final Research Report, August 1968. 71 p, 21 tab, 19 fig, 27 ref. OWRR Project A-013-NMEX.

Descriptors: *Nitrification, Denitrification, Nutrients, *Wastewater, Fish hatcheries. Identifiers: Nutrient removal, *Nitrogen removal.

Nitrification was accomplished in 3 foot deep columns packed with 1/2 inch gravel. Hydraulic loading rates of 1 to 6 gpm/sq ft. The unit rate of nitrification was about 200 mg/hr/cu ft of gravel at hydraulic loading rates of 2 and 8 gpm/cu ft. At 1 gpm/sq ft, nitrification rate was about 100 mg/hr/cu ft of gravel. Submergence of the lower 2 feet of the column extended the contact time and increased the nitrification capacity of the columns to 400 mg/hr/cu ft of gravel at a hydraulic loading rate of 1 gpm/sq ft. Denitrification was accomplished at hydraulic loading rates of 0.25, 0.45 and 1.1 gpm/sq ft giving nitrate reductions of 28 mg/l, 15 mg/l, 15 mg/l and 10 mg/l, respectively. These reductions in nitrate concentration correspond to 560, 540 and 840 gm/hr/cu ft of gravel. About 200 mg/l of COD was used to accomplish these nitrate reductions. W69-06012

THE CHICAGO AREA DEEP TUNNEL PROJECT-A USE OF THE UNDERGROUND STORAGE RESOURCE, Harza Engineering Co., Chicago, Ill.; Bauer Engineering, Inc., Chicago, Ill.; and Metropolitan Sanitary District of Great Chicago, Ill.

For primary bibliographic entry see Field 05G. W69-06021

5E. Ultimate Disposal of Wastes

MINERAL TASTE IN DOMESTIC WATER, California Univ., Berkeley. School of Public Health.

William H. Bruvold.

Cal Univ Water Resources Center Contrib No 127, Dec 1968. 128 p, 5 fig, 2 tab, 23 ref, append. OWRR Proj No A-005-CAL.

Descriptors: *Water quality, *Domestic water, *Taste, *Water chemistry, *Dissolved solids, Potable water, Surveys, Statistical methods, Testing. Identifiers: *Water taste (Mineral).

The taste of water is affected by the common dissolved constituents Ca, Mg, K, Na, bicarbonate, carbonate, Cl, nitrate, and sulfate, which make up most of the dissolved solids in water. Data were collected for use in objectively describing the relationship between mineral content and the general taste quality of water. Objective standards for mineral content are needed to ensure potability for all consumers, particularly in semi-arid regions where water is commonly highly mineralized. A consumer attitude survey technique was developed and taste panels were used to evaluate water taste attitudes. General taste quality and total mineral content showed an inverse linear relationship. Results of panel tests, consumer surveys, and multiple linear regression analyses are tabulated. (Knapp-USGS) W69-06215

THE FEASIBILITY OF DEEP-WELL INJECTION OF WASTE BRINE FROM INLAND DESALTING PLANTS, Oak Ridge National Laboratory, Tenn.

W. J. Boegly, Jr., D. J. Jacobs, T. F. Lomenick, and O. M. Sealand. Office of Saline Water, Research and Development Progress Report No. 432, March 1969. 76 p. OSW-14-01-0001-534.

Descriptors: *Brine disposal, *Brines, *Saline water, *Deep wells, *Injection wells, Waste disposal, Subsurface investigations, Desalination. Identifiers: *Deep well disposal, Deep well usage, Geologic considerations, Desalting.

Literature pertaining to the use of deep-well injection has been reviewed to determine the feasibility of its use for disposing of brine effluents from inland desalting plants. Deep well injection was found to be technically feasible if satisfactory pretreatment is provided. Brine disposal from oil-field operations ranged from \$0.25 to \$0.75 per 1000 gallons of brine. A suitable site for deep-well injection requires a permeable sedimentary formation, such as sandstone or limestone, capped by an impermeable formation, such as shale, to prevent pollution of neighboring potable waters. Detailed geologic and hydrologic investigations will be required to assure that the site is satisfactory and to provide data to be used for designing an injection system. (Gransee-Office of Saline Water) W69-06286

SEWAGE DISPOSAL PLANTS.

For primary bibliographic entry see Field 06E. W69-06342

5F. Water Treatment and Quality Alteration

CHEMICAL AND PHYSICAL CHARACTER OF MUNICIPAL WATER SUPPLIES IN MARYLAND, Geological Survey, Washington, D. C.

Jolly D. Thomas, and Sumner G. Heidel.

Maryland Geol Surv Rep of Invest No 9, 1969. 52 p, 1 fig, 5 tab, 8 ref.

Descriptors: *Water quality, *Municipal water, *Maryland, Water supply, Groundwater, Surface waters, Hardness (Water), Potable water, Water analysis, Water purification, Water sources, Water temperature. Identifiers: Public water supplies.

Data on the quality of municipal waters in Maryland are compiled. The 65 largest public water supplies in Maryland deliver about 378 mgd of water to over 3 million people. More than 80% of 2,444,000 of these people, who use about 320 mgd are supplied by either the Baltimore Bureau of Water Supply or the Washington Suburban Sanitary Commission. Samples of raw and finished water from most facilities were analyzed by the Geological Survey. Sixteen municipal supplies use surface water, 43 use groundwater, and 6 use both surface and groundwater. Surface water serves more than 89% of the population, although more individual communities obtain their supplies from groundwater. Twenty-two public supplies reportedly add fluoride to their water and 10 supplies have natural fluoridation of 0.4 ppm or more. The treated water of most municipalities is soft or moderately hard, and only 7 facilities deliver finished water that is classified as hard water or very hard water. (Knapp-USGS) W69-06031

AN EVALUATION OF SOME METHODS FOR THE DETERMINATION OF FLUORIDE IN POTABLE WATERS AND OTHER AQUEOUS SOLUTIONS, Ministry of Technology, London (England). Lab. of Government Chemist.

N. T. Crosby, A. L. Dennis, and J. G. Stevens. Analyst, Vol 93, No 4, pp 643-652, Oct 1968. 10 p, 9 tab, 24 ref.

Descriptors: *Analytical techniques, *Fluorides, *Evaluation, *Aqueous solutions, Colorimetry, Spectrophotometry, Water analysis, Laboratory tests. Identifiers: Ion-specific electrodes.

Five spectrophotometric procedures for the determination of fluoride in water have been evaluated with respect to reproducibility, sensitivity, range, stability of coloured products and of reagents, specificity and effect of temperature. The thorium nitrate titration is briefly discussed, and the use of the Orion fluoride-ion electrode for pH measurement has also been investigated. Various samples of water containing natural or added fluoride have been analysed by 4 of the spectrophotometric methods, and the results compared with those obtained by titration and with the electrode. The electrode is shown to be less susceptible than the colorimetric methods to interference from other ions in solution, and it gives theoretical recoveries of fluoride added to several drinking water supplies. W69-06037

5G. Water Quality Control

ALTERNATE METHODS OF MOSQUITO CONTROL TO REDUCE CHEMICAL POLLUTION OF WATERS FOR RECHARGE OF THE OGALLALA FORMATION, Texas Technological Coll., Lubbock.

Charles R. Ward, John C. Owens, Ellis W. Huddleston, and Donald Ashdown.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

Texas Water Resources Center, Project Completion Report WRC-69-4, April 1969, 38 p, 3 tab, 11 fig, 11 ref, 1 append. OWRR Project B-007-TEX.

Descriptors: *Mosquito control, *Chemical pollution, Surface water, Recharge, Ogallala formation, *Playa lakes, Cultural control, Non-chemical control.

Several cultural controls were evaluated in replicated small plot experiments and in two seasons on whole-lake-bed treatments. Plastic pens prevented larval migration among treatments in replicated small plot treatments which were evaluated by dipper sampling of larvae following two inundations. Cultural methods evaluated and the average numbers (over both inundation periods) of *Aedes* larvae per dip were as follows: check (8.6), one-way disc plow (2.4), tandem disc plow (2.3), propane burner (1.9), moldboard plow (1.4) and roto-tiller (0.2). In the whole-lake-bed treatments in 1967, the primary species present were in *Culex*; the cultural methods and the average larvae per dip were: check (0.8), ditches to pits with pumps (0.6), tandem-plowed around a pumping sump (0.1) and lister-plowed (0.0). In 1968, primarily *Aedes* larvae were present in all study lakes. The cultural methods studied and the average larvae per dip were: check lakes (2.0); pit-modified (0.6); pit-modified plus water-pumped (0.5); tandem-plowed (0.2); pit-modified, water-pumped and basin tandem-plowed (0.1); and lister-plowed (0.0). Plowing should substantially reduce mosquito production and consequently the amount of pesticides applied for control; high turbidity levels may follow plowing.

W69-06001

NITROGEN REMOVAL FROM NATURAL WATERS,

New Mexico State Univ., Las Cruces. Engineering Experiment Station.
For primary bibliographic entry see Field 05D.

W69-06012

ECOLOGICAL RELATIONSHIPS OF ORGANIC MATTER AND BACTERIA IN TUTTLE CREEK RESERVOIR,

Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 02H.

W69-06014

THE CHICAGO AREA DEEP TUNNEL PROJECT-A USE OF THE UNDERGROUND STORAGE RESOURCE,

Harza Engineering Co., Chicago, Ill.; Bauer Engineering, Inc., Chicago, Ill.; and Metropolitan Sanitary District of Great Chicago, Ill.
V. A. Koelzer, W. J. Bauer, and F. E. Dalton.
J Water Pollut Contr Federation, Vol 41, No 4, pp 515-534, Apr 1969. 20 p, 17 fig, 1 tab.

Descriptors: *Water pollution control, *Storm drains, *Underground storage, *Illinois, Water pollution sources, Municipal wastes, Industrial wastes, Sewage, Sewage treatment, Sewage disposal, Sub-surface drainage.

Identifiers: Chicago (Ill), Chicago deep tunnel plan.

The Greater Chicago area is plagued with recurring water pollution and flood problems stemming from 3 sources--industry, wastewater treatment plant effluent, and combined storm and sanitary sewer overflows. A solution to all 3 sources is the Deep Tunnel Project. It will capture stormwater overflows from combined sewers, dropping them through vertical shafts to a tunnel network. The polluted water will be conveyed for temporary storage in a large mined underground reservoir 800 ft (242 m) below the surface. Preliminary design studies including project features, feasibility, costs, performance, and benefits, as well as operation, are discussed. Tunneling methods are included. (Knapp-USGS)

W69-06021

EUROPEAN PRACTICE IN WATER QUALITY CONTROL,

Pennsylvania Dept. of Health, Harrisburg. Div. of Sanitary Engineering.

Walter A. Lyon.

ASCE Proc, J Sanit Eng Div, Vol 93, No SA3, Pap 5284, pp 37-45, June 1967. 9 p, 13 ref.

Descriptors: *Water management (Applied), *Water policy, *Water quality control, Water districts, Governments, River basin commissioners, River basin development, Planning, Water resources development, Watershed management. Identifiers: *Europe, European water quality control.

Changes in European public policy regarding pollution control are examined, including the public response to the pollution problem, a summary of recent legislative activity, and intergovernmental relationships. The use of classification systems and the organization of water-pollution control efforts are evaluated, in addition to permit systems and the role of nongovernmental organizations in shaping water-pollution-control policies. In Europe, there appears to be a movement toward decentralized river-basin management of water-pollution control and waste treatment. Increased pollution of streams in the industrial sectors of most countries has had an adverse effect on many of the uses of rivers, particularly recreational uses. As a result, conservationists, fishermen, and professionals have called for, and received, with the help of an interested press-stricter laws regarding pollution control. (Knapp-USGS)

W69-06078

WATER QUALITY CONTROL - THE ROLE OF THE INTERSTATE AGENCY,

Water Pollution Control Federation, Washington, D. C.

James F. Wright.

Journal, Water Pollution Control Federation, Vol 40, No 8, pp 1403-1407, Aug 1968. 5 p.

Descriptors: *Delaware River Basin Commission, *Inter-agency cooperation, *Interstate commissions, *Water pollution control, Administrative agencies, Coordination, Federal government, Formulation, Governments, Interstate rivers, Water resources development, Organizations. Identifiers: Interstate agencies.

The Delaware River Basin Commission, an interstate agency, employs two distinct processes: (1) formulation of standards; and (2) implementation of the standards formulated. The formulation of standards includes: (1) a determination of the uses to which a stream could be put; (2) the establishment of a stream quality criteria for these uses; (3) an analysis of different combinations of treatments; and (4) the establishment of effluent requirements. The plan of implementation focusses on: (1) regulations establishing operational conditions; (2) a timetable for implementation; (3) a procedure for allocating available assimilative capacity within the river; (4) programs for attacking the noncarboaceous inputs; (5) systematic review and revision of the first four areas as experience is gained. The role of an interstate agency is characterized by seven aspects. It is able to: (1) see things in perspective; (2) develop a regional plan; (3) allow states to reinforce each other's position; (4) deal with residual effluents discharged into an interstate stream; (5) provide a forum for reconciliation of opposing views as to water use; (6) have the advantage of a federal approach; and (7) provide a structure from which a joint political and administrative effort can be launched. (Mollica-Fla)

W69-06094

WATER QUALITY STANDARDS: THE FEDERAL PERSPECTIVE PROGRESS TOWARD OBJECTIVES,

Water Pollution Control Federation, Washington, D. C.

Allan Hirsch, James Agee, and Robert Burd.

Journal, Water Pollution Control Federation, Vol 40, No 9, pp 1601-1606, Sept 1968. 6 p.

Descriptors: *Water quality act, *Administrative agencies, *Project planning, *Standards, Water quality control, Water pollution, Administration, Water resources development, State governments, Programs, Federal government, Regulation, Legislation.

Identifiers: FWPCA.

The Water Quality Act of 1965 provided for state establishment of water quality standards. Such an undertaking necessarily involves: (1) determination of the uses to be made of a given body of water; (2) formulation of criteria of water quality necessary to support such uses; and (3) development of a plan to achieve and maintain those criteria. The FWPCA has issued 'Guidelines for Establishing Water Quality Standards,' and the Secretary of the Interior has appointed an advisory committee on water quality criteria to help guide the states in establishing acceptable standards. Thus far, the standards submitted have been either too general or too specific. Particular guidelines may reflect policies which seem arbitrary because of major gaps in our knowledge concerning the effects of waste loads on the receiving waters and the behavior of wastes in the environment. The standards implementation plans are now recognizing problems such as thermal pollution, animal feed lots, vessel pollution, etc. Because of the agency's limited time and resources, a major weakness of the standards is their failure to provide for future problems which will necessarily evolve from continued economic development of the nation. (Mollica-Fla)

W69-06095

FITTING A STATE PROGRAM TO FEDERAL OBJECTIVES,

Water Pollution Control Federation, Washington, D. C.

Clarence W. Klassen.

Journal, Water Pollution Control Federation, Vol 40, No 10, pp 1702-1710, Oct 1968. 9 p.

Descriptors: *Inter-agency cooperation, *Water pollution control, *Adoption of practices, *Water quality act, Administration, Administrative agencies, Coordination, Federal government, Federal Project Policy, Governments, State governments, Social participation, Project planning.

Adapting a state program of water pollution control to coincide with federal objectives has been difficult because of the evasiveness of the federal objectives. For example, the Federal Clean Water Act does not define 'pollution,' and the courts have had to enforce the laws on the basis of state definitions. However, benefits have also accrued to the states; federal grant programs have helped in getting local support behind bond issues for improvements, and the public attention focused on water pollution has had a salutary effect on industry. The states have also had difficulty in translating the federal guidelines into practical procedures. The requirement that states adopt a comprehensive planning technique for pollution control has been a major contribution of the federal program. A pollution control agency must function in the areas of prevention, abatement and control; and cooperation between the states and the federal government is imperative, especially in the area of prevention. (Mollica-Fla)

W69-06096

SANITARY WATER BOARD V ANTHONY (LEGISLATION TO PREVENT MINE ACID POLLUTION).

Dauphin County Reports Vol 66, pp 250-261 (C P Pa 1954).

Descriptors: *Administrative agencies, *State governments, *Legislation, *Acid mine water, Judicial decisions, Legal aspects, Mine drainage, Coal mine wastes, Strip mine wastes, Public health, Reservoirs, Domestic water, Public rights, Water distribution (Applied), Eminent domain, Condemnation, Water pollution control, Pennsylvania. Identifiers: Administrative law.

Appellants filed an application with the Sanitary Water Board for a permit to conduct strip mining in the vicinity of Furlong Run. The application was denied by the Board after objection of a local water company who feared acid water pollution of its source streams. The statute creating the Board divides the waters of the Commonwealth into three categories: (1) clean waters which are devoted to public use; (2) clean waters; and (3) polluted or unclean waters. The present case involved conjectural acid pollution of waters in the first category. The defendant contended that the statute should be strictly construed and that a duty existed for the Commonwealth to provide, at its own expense, facilities for the removal of acid mine drainage until such time as, in the opinion of the Board, practical means for the disposal thereof should become known and that, in the meantime, they should be allowed to operate their strip coal mine without a permit. The court held that such a construction of the pertinent statute would defeat the manifested intent of the legislature and affirmed the Board's denial. (Katz-Fla) W69-06109

MADDOX V INTERNATIONAL PAPER COMPANY (DAMAGES RESULTING FROM BAYOU POLLUTION).

105 F Supp 89-94 (W D La 1951).

Descriptors: *Louisiana, *Water pollution, *Pulp wastes, *Industrial wastes, Pulp and paper industry, Effluents, Water pollution sources, Fishkill, Waste water (Pollution), Wastes, Streams, Odor, Water pollution effects, Pollutants, Judicial decisions, Water law, Legal aspects, Damages.

After the pollution of a bayou, plaintiff brought suit against defendant, paper company to recover damages for the total destruction of his fishing camp and business, for loss of improvements on his property, for loss in property value, and for the permanent loss of a stream. In awarding damages for final settlement of all claims, the court ruled that a prior judgment and later compromise between the parties affected claims only up to a certain date, and did not affect the present suit. The court noted that plaintiff had never been paid for the permanent losses claimed, and that he had been talked into believing that the pollution was to be totally corrected. The court held that no one has a legal right to use a public stream for the discharge of effluent lethal to fish without paying for injuries caused. (Wheeler-Fla) W69-06112

PUNXSUTAWNEY WATER SERVICE CO V SARICKS (CONTAMINATION FROM STRIP MINING).

354 Pa 106, 46 A 2d 673-674 (1946).

Descriptors: *Pennsylvania, *Water pollution, *Strip mine wastes, *Water supply, Strip mines, Water law, Acid mine water, Coal mines, Water pollution sources, Pollutants, Reservoir storage, Public utilities, Water quality, Mine acids, Mine wastes, Water pollution effects.

Identifiers: Injunctions (Preliminary).

Plaintiff water service company filed suit in equity praying that defendants be enjoined from further strip mining and ordered to replace ground already stripped. Upon affidavit and bond, a preliminary injunction was issued. After hearing to determine whether this injunction should be continued, the lower court ordered the injunction dissolved. Five separate streams lead into plaintiff's reservoir, but plaintiff offered evidence that only one of the five was in danger of contamination. Plaintiff failed to show the amount of the stream's present contamination, the proportion of water from this branch to the reservoir's total intake, and the degree of future contamination anticipated. The appellate court affirmed, ruling that plaintiff failed to show that it was in imminent danger and that the continuance of the preliminary injunction was necessary to preserve the status quo. The preliminary

injunction was dissolved, with the case to proceed on the merits. (Wheeler-Fla) W69-06113

JONES V BREYER ICE CREAM CO (PREScriptive RIGHTS TO POLLUTE STREAM WATERS).

1 App Div 2d 253, 149 NYS 2d 426-428 (Sup Ct NY 1956).

Descriptors: *Stream pollution, *Nuisance, *Prescriptive rights, *New York, Judicial decisions, Public health, Water pollution, Ponds, Refuse, Wastes, Domestic wastes, Liquid wastes, Sewage, Waste identification, Riparian ownership, Milk, Legal aspects.

Identifiers: Public nuisance. Private nuisance.

Plaintiff brought suit to enjoin the defendants from polluting the plaintiff's pond. Defendants contend that they acquired a prescriptive right to pollute the pond with waste as long as the pollution amounted to no more than a private nuisance as distinguished from a public nuisance. It is settled law in New York that fresh-water streams may not be polluted and the right to pollute any may not be acquired by prescription. However, this law applies only to a public nuisance. A prescriptive right may be acquired to pollute the waters of a pond if it is only a private nuisance. The defendants were discharging water and waste milk. The court ruled whether this came within the meaning of refuse and sewerage so as to constitute a public nuisance was a question to be determined at trial. (Stewart-Fla) W69-06114

B AND B OIL CO V TOWNSEND (OIL WASTE POLLUTION).

192 SW 2d 953-955 (Ky Ct App 1946).

Descriptors: *Kentucky, *Water pollution, *Oil wastes, *Saline water, Judicial decisions, Water pollution, Pollutants, Water pollution effects, Fishkill, Oily water, Ponds, Farm ponds, Boundaries (Property), Mineralogy, Natural gas, Oil wells, Stock water.

Plaintiff's property adjoined land upon which defendant maintained storage tanks for oil and salt water. Refuse from the oil and salt water was released from the tanks and allowed to run along the surface of the ground to plaintiff's land, temporarily polluting a pond. The court found defendant liable for damages. If the owner of an oil or gas well negligently permits oil, gas, or salt water to escape, the resulting injury is actionable: (1) if not within the reasonable contemplation of the parties to the lease of the land; or (2) if adjoining land is injured. A new trial was granted as to the issue of damages. The measure of damages for temporary injury to land is an amount equal to the diminution in the value of the use to which the land may be put. Plaintiff had failed to show the value of the use of the polluted pond. (Helwig-Fla) W69-06115

SMITH V MAGNET COVE BARIUM CORP (BARIUM TAILING POLLUTION).

206 SW 2d 442-446 (Ark 1947).

Descriptors: *Riparian rights, *Arkansas, *Industrial wastes, *Water pollution, Judicial decisions, Impaired water quality, Water pollution effects, Color, Fishkill, Domestic wastes, Municipal wastes, Animal wastes, Sediments, Water pollution sources, Reasonable use, Water rights, Wastes, Relative rights, Damages.

Identifiers: *Barium tailings, Injunctions (Prohibitory).

Defendant used the water of a creek to dispose of tailings, the residue produced from the process of extracting barium from ore-bearing earth. Plaintiff owned riparian land downstream from defendant.

Plaintiff alleged that pollutants from defendant's plant injured fish, poisoned plaintiff's cattle, and caused permanent damage to the land due to barium sediment deposits which remained on the stream banks following periodic floods. Plaintiff sought damages and injunctive relief. The court entered judgment for \$750 damages, but dismissed the plea for an injunction on the grounds that the plaintiff had an adequate remedy at law. The damage award granted to the plaintiff was the only appropriate relief in these circumstances since there was evidence of other contributing sources of pollution. (Helwig-Fla) W69-06116

PHILLIPS V SUN OIL CO (GASOLINE POLLUTION OF WATER WELL).

307 NY 328, 121 NE 2d 249-251 (1954).

Descriptors: *New York, *Water wells, *Gasoline, *Water pollution sources, Judicial decisions, Fuels, Wells, Water pollution, Seepage, Groundwater, Percolating water, Well regulations, Percolation, Subsurface drainage, Shallow wells, Subsurface waters, Legal aspects.

Identifiers: Trespass, Injunctions (Prohibitory), Nuisance.

Plaintiff owned land adjacent to defendant's underground gasoline storage tanks. Gasoline traveled underground to plaintiff's land and seeped into his water well, contaminating his water supply. Plaintiff brought this action in trespass to recover damages. The court held that trespass is an intentional harm. The trespasser need not intend or expect the consequence of his action in order to be held liable therefor, but he must intend the act which produces the unlawful intrusion. Even though the pollutant had deliberately been put into the land, defendant is not liable for a neighbor's damage therefrom unless he had good reason to know that there would be seepage to the neighbor's land. Since defendant did not know of the leaking gasoline, he was not liable for damages resulting therefrom. Injunctive relief may have been available to prevent future harm to the water supply. (Helwig-Fla) W69-06117

PHOENIX V GRAHAM (SALT WATER POLLUTION OF WELLS).

349 Ill App 326, 110 NE 2d 669-673 (1953).

Descriptors: *Illinois, *Saline water, *Wells, Judicial decisions, Oil wastes, Water quality, Salinity, Percolating water, Well spacing, Shallow wells, Groundwater, Water sources, Drainage, Riparian rights, Artesian wells, Ditches, Drainage effects, Seepage, Waste storage, Legal aspects.

Plaintiff was lessor of certain oil producing land upon which defendant lessee had wells. Salt water pumped from the wells and negligently discharged by defendant polluted plaintiff's water wells. Defendant and his predecessor had dug pits to store the salt water, and the wells became unusable soon after enlarging one of the storage pits. While there is a conflict among the jurisdictions regarding liability from salt water damage, the court held that adjoining landowners and other downstream owners have a right to receive water in its natural state. However, lessors have no action for salt damage to their own land from sources on the land unless such damage is caused by lessee's negligence. The lessee well operator is required to use the care of an ordinary prudent operator; he has the right to use that part of the leased land for salt water disposal as is reasonably necessary. There was sufficient evidence in this case to show negligence on the part of the lessee, however, the court remanded on the issue of damages. Plaintiff failed to demonstrate permanent damage to his water supply or to show lack of another water source. (Helwig-Fla) W69-06118

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Group 5G—Water Quality Control

COMMONWEALTH V BLACK (INJUNCTION RESTRAINING STRIP MINING OPERATIONS). 363 Pa 231, 69 A 2d 376-381 (1949).

Descriptors: *Pennsylvania, *Permits, *Stream pollution, *Strip mine wastes, Water pollution, Water pollution control, Water pollution, Strip mines, Legal aspects, Judicial decisions, Mine acids, Coal mine wastes, Acid mine waters, Wastes, Waste treatment, Water quality, Public benefits, Legislation, Administrative agencies, Discharge (Water).
Identifiers: Injunctions (Prohibitory).

The state filed a bill in equity, praying that an injunction be issued to enjoin discharge of acidic mine drainage from defendants' strip mining operation into clear stream waters devoted to public use. The Chancellor refused to permanently enjoin operation of the mine, but did restrain defendants from causing pollution. The Commonwealth then amended its petition and asked that defendants' operations be enjoined until the latter had secured approval from the Sanitation Water Board for a proposed drainage plan as required by statute. The Chancellor ruled that, since pollution was not proven, the Board's approval was not required. The appellate court reversed, ruling that the issue was not whether defendant was causing pollution, but whether approval had been secured from the Sanitary Water Board. (Wheeler-Fla)
W69-06119

MASONITE CORP V WINDHAM (PONDING AND POLLUTION ON UPPER LAND).

48 So 2d 622-625 (Miss 1950).

Descriptors: *Mississippi, *Obstruction to flow, *Ponding, *Water pollution, Dams, Culverts, Riparian rights, Drainage, Land tenure, Judicial decisions, Relative rights, Damages, Surface runoff, Legal aspects, Alteration of flow, Water pollution sources, Industrial wastes.
Identifiers: *Accumulation, *Upper landowner, *Lower landowner.

Suit by upper riparian owner against lower riparian owner for damages allegedly caused by ponding of waters on upper land and the pollution of the pond by oils, greases and other deleterious matter discharged by the defendant masonite company. The plaintiff and defendant are adjacent landowners and riparians as to a creek running through or along their lands. When defendant acquired its land, plaintiff's land was drained by way of trestle openings in a railroad embankment at its boundary. Appellant closed three of these trestles, replacing them with culverts, and constructed a dam which, together with the embankment, formed a triangle where deleterious matter was deposited. This matter caused a noxious stench and the pollution of the ponds caused on plaintiff's land by defendant's obstruction of drainage. A judgment below for plaintiff in the amount of \$5,000.00 was appealed. The Supreme Court of Mississippi held that a lower land owner may take necessary steps to carry upper diffused waters away from his land, as long as he does not use upper land in doing so, or so impede the flow of water as to cause accumulation upon the upper land. Even without this law, liability in the present case was validly based on the pollution alone, and the judgment below was affirmed. (Harris-Fla)
W69-06120

QUALITY CHARACTERISTICS OF WATER RESOURCES, Research Inst. for Water Resources Development, Budapest (Hungary).

L. Bartfai-Szabo, L. Felfoldy, and L. Szabolcs. 2nd Int Postgrad Course on Hydrol Method for Develop Water Resources Manage, Budapest, Hung, Jun-July 1968, Manual No 6, 1968. 95 p, 9 fig, 8 tab, 195 ref.

Descriptors: *Water quality, *Water pollution sources, Water quality control, Water management

(Applied), Legislation, Water utilization, Water supplies, Radioactive wastes, Sewage.
Identifiers: *Textbooks, *Technical manuals.

Methods for determining water quality, pollution, and water quality requirements, are discussed in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. Surface and groundwater composition are described as functions of the geological, hydrological, and cultural environment. The kinds and sources of water pollution, the process of self-purification, and sewage control are discussed. Biological methods are given for water quality estimation. Radioactive stream pollution and its control are described. Chemical analysis methods are listed and discussed. (Knapp-USGS)
W69-06225

OIL POLLUTION - A REPORT TO THE PRESIDENT.

Department of the Interior, Washington, D. C.; and Department of Transportation, Washington, D. C. For primary bibliographic entry see Field 05B.
W69-06237

EUFALIA RESERVOIR AERATION RESEARCH-1968,

Robert S. Kerr Water Research Center, Ada, Okla. Lowell E. Leach.
Fed Water Pollut Contr Admin open-file rep, 1968. 8 p, 5 fig.

Descriptors: *Reaeration, *Reservoirs, *Thermal stratification, Hypolimnion, Epilimnion, Tailwater, Dissolved oxygen, Mixing, Diffusion, Monitoring.
Identifiers: Reservoir aeration, Reservoir destratification.

Aeration experiments were carried out in Eufaula Reservoir, Oklahoma, which has a surface of 102,500 acres and stores 2,800,000 acre-ft. The central pool, in which most of the tests were done, has a surface of 10,800 acre-ft and a volume of 570,000 acre-ft. In January 1968, 17 sampling stations were located by triangulation. Vertical temperature and dissolved oxygen profiles were taken every 2 weeks during winter and spring to determine the progress of stratification. Stratification occurred late, in mid-July, and became stable in late July with thermocline at 60 ft near the dam and 50 ft upstream. Aeration was by six 40-ft lengths of 4 in pipe, each having 8 equally spaced microporous diffusers, and a 1,200 cfm compressor. Aeration started Aug 2 at 1,200 cfm discharged at 95 ft depth. Oxygen in discharged water increased from 3 mg/l to a range of 4.0 to 5.5, but aerated water was discharged through the generators as fast as it accumulated in the hypolimnion. The aeration was too close to the power intakes to affect a large area, but great benefit to the quality of power discharges and downstream water resulted. (Knapp-USGS)
W69-06255

HARVESTING UNDERWATER WEEDS, Wisconsin Univ., Madison. Dept. of Mechanical Engineering.

Donald F. Livermore.
Water Works Eng, pp 118-120, 151, Feb 1954. 4 fig, 4 ref.

Descriptors: *Aquatic weed control, *Eutrophication, *Harvesting, Aquatic plants, Aquatic weeds, Economic feasibility, Lakes, Nuisance algae, Water pollution control, Nutrients, Water pollution effects, Water pollution sources, Wisconsin.
Identifiers: Lake Mendota (Wis), Lake Monona (Wis), Lake Kegonsa (Wis), Lake Waubesa (Wis), Madison (Wis), University of Wisconsin, Yahara River (Wis), Nutrient removal.

One approach to eutrophication control is repeated harvesting of a nutrient-laden crop, its removal from the water, and its utilization, transformation, or transfer from the threatened drainage basin.

Author presents design for a mechanical harvester, developed at University of Wisconsin, which will cut and collect underwater weeds. He describes operation of prototype model which was functional to depth of five feet, operated at speeds of 1-2 miles/hour, and could remove over four tons of drained weeds/hour. Cost of operating machinery of this type would necessarily be quite high. Author estimates, for era when this paper was written, that initial investment for one harvesting machine, three 'shuttle' barges for transportation of harvested plants, and docks and unloading facilities would be in range of \$20,000 and that an annual operating budget of \$10,000-\$15,000 would be required to cover fixed and operating charges. Mechanical harvesting of macrophytes would not only remove plant nutrients but would also eliminate some undesirable end effects of eutrophication by clearing boating and swimming areas and by eliminating scum areas which develop from entrapment by emergent plants of algae and other floating debris. Author suggests that harvested lacustrine plants may have potential commercial value. (Eichhorn-Wis)
W69-06276

WASTES, WATER, AND WISHFUL THINKING: THE BATTLE OF LAKE ERIE, Case Western Reserve Univ., Cleveland. Arnold W. Reitze, Jr. Case W Res L Rev, Vol 20, No 1, pp 5-86, Nov 1968. 82 p, 448 ref.

Descriptors: *Ohio, *Lake Erie, *Water pollution control, *Pollution abatement, Pollutants, Wastes, Thermal pollution, Toxins, Pesticide residues, Phosphates, Algae, Sewage, Water pollution, Water law, Water pollution effects, Water pollution sources, Water pollution treatment, Financing, Grants, Federal government, State governments, Water quality standards.

Lake Erie is seriously polluted, and its continued use as a public water supply is in jeopardy. The pollutants include sewage, phosphates, organic chemicals, and petroleum products. The federal government has passed pollution statutes which date back to the 19th Century, but the first serious attempt to clean up Lake Erie began in 1965, under the Federal Water Pollution Control Act. Under this act, the states are required to set water quality standards for their navigable waterways. Each jurisdiction must maintain the existing quality of the water and may not allow treatable wastes to be discharged into the water in an untreated state. Ohio has established pollution standards, but these standards are criticized because they assume the water does not have to be pure and because they are too vague and inconsistent. The pollution abatement of Lake Erie requires the efforts of federal and state administrative agencies and of the courts. The attempt at pollution abatement over the last three years has ended in failure. Ohio expends only \$239,000 yearly on its river sanitation program; approximately ten billion dollars are needed to clean Lake Erie. (Hoffman-Fla)
W69-06305

MUNICIPAL WATER POLLUTION CONTROL, Minn Stat Ann secs 115.41 to 115.43, 115.49 (1) (1967).

Descriptors: *Minnesota, *Water pollution control, *Cities, *Water quality, Pollution abatement, Biochemical oxygen demand, Public health, Sewage, Industrial wastes, Water conservation, Classification, Flow characteristics, Flotsam, Colloids, Bacteria, Bodies of water, Water utilization, Contracts, Legislation, Administrative agencies, Administrative regulation.
Identifiers: *Stream gradient.

The Water Pollution Control Commission, in the furtherance of water conservation and public health, shall prevent and abate pollution of state waters. The commission may, after notice and hearing, issue or revoke regulations and orders to

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prohibit or abate the discharge of wastes into state waters. No single standard of water purity is applicable to waters of the state; however, after investigation and public hearing, the commission shall classify the state's waters in the public interest. Classification factors shall be size, depth, surface area, volume, direction and rate of flow, stream gradient, temperature, character of the surrounding district, present and future uses, extent of present pollution, and the need of standards for effluent from disposal systems. After classification, standards of purity for each class shall be set after study and public hearing. Consideration is to be given to the extent to which floating solids, suspended solids, and bacteriological organisms may be permitted in the water. Also to be considered is the degree of oxygen demand permitted in the receiving waters, and other chemical and biological properties. Notice for adoption or modification of classifications and standards shall be made according to this act. The commission may, after a hearing, determine that cooperation by contract between two or more municipalities is desirable to prevent pollution. (Harris-Fla) W69-06316

STATE V TOWN OF GOFFSTOWN (SUIT TO FORCE COMPLIANCE WITH ORDER TO ABATE RIVER POLLUTION).

121 A 2d 317-320 (N H 1956).

Descriptors: *New Hampshire, *Municipal wastes, *Water pollution, *Water pollution sources, Sewage effluents, Public health, Organic wastes, Impaired water quality, Judicial decisions, Administrative agencies, Rivers, Sewage treatment, Tax rate, Legislation, Classification, Recreation, Cities, Adjudication procedure, Remedies, Regulation, Financing.

Identifiers: Injunctions (Mandatory), Delegation doctrine.

The state Water Pollution Commission ordered defendant town to stop discharging inadequately treated sewage into a river. The town's voters refused to approve certain financing arrangements for a treatment plant. No petition for reclassification or variance was filed. The state sued for injunctive relief, praying that defendant be compelled to comply with the order. Determination of whether the state was entitled to such relief was transferred to the appellate court which held the state was so entitled and remanded to the lower court for a determination of how this order should be implemented. The Commission's order was held constitutional as made pursuant to a proper delegation of legislative power. The debt limit of a municipality may be increased in order to promote the state's interest in public health. The increase in tax rate was neither unreasonable nor confiscatory. (Wheeler-Fla) W69-06330

LEGAL ASPECTS OF NEW JERSEY POTABLE WATER PROGRAM, John Wilford. J Amer Water Works Ass'n, Vol 61, No 4, pp 193-197, April 1969. 5 p.

Descriptors: *New Jersey, *Potable water, *Water supply, *Public health, Legislation, Sanitation, Administrative agencies, Project purposes, Water pollution, Water purification, Public utilities, Water treatment, Domestic water, Water quality, Waterworks, Equipment, Water quality control, State governments, Legal aspects, Planning.

New Jersey has recently undertaken to modernize its laws dealing with potable water. The present statutes were enacted in 1890 and need to be replaced by more dynamic and modern provisions. The goal of the planned revision is to make New Jersey's potable water program as modern as any in the country. A great deal of new legislation was introduced, and most bills passed without difficulty. Several desirable statutes were passed to deal with

the licensing of superintendents of water supply systems. The definition of public water treatment plants was expanded to include certain water plants not previously covered. Important new amendments were made to allow more control over physical connections which transmit water supplies. The new laws also imposed stricter standards regarding potable water and the disinfection of water supplies. In addition, municipalities now have authority to force residents to connect to the public water supply main. The only evil which the revisions commission did not remedy, is that of selling polluted potable water. The statute needs to be amended to define and set standards applicable to contaminated or impure water. (Stewart-Fla) W69-06331

CREATION OF DEPARTMENT OF WATER RESOURCES AND WATER RESOURCES COMM'N.

For primary bibliographic entry see Field 06E. W69-06333

AN ACT RELATING TO LAKES, PERMITTING THE CREATION OF LAKE CONSERVATION DISTRICT WITH CERTAIN POWERS.

For primary bibliographic entry see Field 06E. W69-06334

AN ACT ESTABLISHING AN INTERIM COMM'N TO STUDY THE PROBLEM OF WATER POLLUTION AND APPROPRIATING MONEY THEREFORE.

Minn Sess Laws, ch 779 (1957).

Descriptors: *Minnesota, *Water pollution control, *Legislation, *Sewage districts, Water pollution, State governments, Legal aspects, Appropriation, Planning, Rivers, Streams, Lakes, Subsurface waters, Long-term planning, Regulation, Financial feasibility, Investigations, Pollutant, Identification.

An interim commission is created to study the problem of water pollution with respect to rivers, streams, lakes, and subsurface waters of the state, to consider the feasibility of establishing sanitation districts were needed and to recommend reasonable methods of controlling the problem of pollution. (Wheeler-Fla) W69-06335

WATERWORKS, MAIN SEWERS, SEWAGE DISPOSAL PLANTS.

Minn Stat Ann sec 444.075 (1) (1947).

Descriptors: *Minnesota, *Sewage, *Sewage treatment, *Water works, Cities, Legislation, Condemnation, Industrial wastes, Construction, Structures, Sewage disposal, Easements, Sewers, Reservoirs, Sewage systems, Local governments, Legal aspects, Maintenance.

Cities, except those under home rule, and villages are authorized and empowered to build, maintain, and improve waterworks systems and sewers, and to acquire by gift, purchase, lease, condemnation or otherwise any land and easements so required. (Wheeler-Fla) W69-06336

SEWAGE DISPOSAL: WATER AND SEWAGE.

Minn Stat Ann secs 442.03, 442.24, 442.25 (1947).

Descriptors: *Minnesota, *Water works, *Sewage treatment, *Cities, Legislation, Sewage systems, Construction, Control, Power plants, Pumping, Pumping plants, Damages, Operation and maintenance, Operations, Local governments, Diversions (Water), Administrative agencies, Management, Navigable waters, Regulation, Sewage disposal.

Identifiers: Penalties (Criminal).

In cities of the second class, there is created a board of municipal works, with designated powers and duties, having the power to control and manage all city-owned water works systems, lighting plants, and sewage pumping plants. Cities on a navigable river and having a municipal sewage plant are exempt from requirements of the board so far as pumping and disposal of sewage are concerned. Treble damages are imposed for malicious or willful diversion and corruption of water from waterworks or causing damage to plant property or injury to plant operations. All such acts are declared also to be gross misdemeanors, carrying a maximum fine of \$1000 and/or one year imprisonment. The board shall have no powers until the completion and installation of the municipal works. (Wheeler-Fla) W69-06337

FISH.

Minn Stat Ann secs 101.42 to 101.43, 101.47 (1946), as amended, (Supp 1968).

Descriptors: *Minnesota, Pollution abatement, *Dams, Fish conservation, Dam construction, Obstruction to flow, Piers, Watercourses, Permits, Fish, Wildlife, Fish barriers, Fish passages, Fish toxins, Pesticides, Fish behavior, Fishing, Water pollution effects, Fish management, Wildlife management, Fish migration, Fish populations, Streams, Creeks, Lakes, Rivers, Pollutants, Water pollution, Water pollution control, Wastes, Legislation, Piers, Permits, Administrative agencies.

It shall be unlawful to construct or maintain any dam or other obstruction except a boat pier in public waters without first obtaining a permit to do so and complying with the permit requirements for an adequate fishway. It is unlawful to discharge into the waters of the state any water which causes injury to any fish or wildlife in such waters. If the violation is recurrent, the attorney general may institute action to enjoin and abate such nuisances. No person shall place in any creek, stream, or river a screen or rock which prevents the passage of fish, and any such obstruction shall be removed upon order of the commissioner. The commissioner of conservation may establish a list of lakes and rivers which have been found to contain an unbalanced fish population or a species of fish which, by over-crowding, have become stunted. The seasons, limits, and methods of taking fish from such lakes and rivers may be prescribed by the commissioner. (Shevin-Fla) W69-06339

OHIO RIVER VALLEY WATER SANITATION COMPACT.

N Y Pub Health Law sec 1190 (McKinney Supp 1968).

Descriptors: *Interstate compacts, *Interstate commissions, *New York, *Water pollution, Legislation, Illinois, Kentucky, Indiana, Ohio, Pennsylvania, Tennessee, West Virginia, River Basin Commissions, Ohio River, Legal aspects, Pollution abatement, River basins, State governments, Water policy, Administrative agencies, Interstate rivers, Industrial wastes, Watershed management, Watersheds (Basins), Water quality control.

This compact was entered into by the states of Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Tennessee and West Virginia for the purpose of abating existing pollution and controlling any future pollution in the Ohio River Drainage Basin. The compact establishes a Water Sanitation Commission which is composed of three representatives from each of the signatory states and three from the federal government. The functions of the Commission include the study of the pollution problems of the Ohio River Valley Water Sanitation District, the submission of reports for the prevention or reduction of stream pollution, and the recommendation of appropriate legislation dealing with water pollution problems. The Com-

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pact provides a procedure by which the Commission may order any municipality, corporation, person, or other entity discharging sewage or industrial waste into the Ohio River or any other river to discontinue such discharge, and it provides that such an order shall be enforced by the courts of the signatory states. (Sisserson-Fla)

W69-06344

SOUTHLAND CO V AARON (ACTION FOR POLLUTION OF DOWNSTREAM WATER SUPPLY).

77 So 2d 161-169 (Miss 1954).

Descriptors: *Water pollution, *Riparian rights, *Waste disposal, *Mississippi, Judicial decisions, Legal aspects, Streams, Artificial use, Water pollution control, Pollution abatement, Riparian lands, Oil wastes, Industrial wastes, Water quality, Impaired water quality, Water quality control, Damages, Oil industry, Domestic water, Industrial water.

Appellee claimed that appellant's operation of an oil refinery had caused pollution of appellee's downstream water supply. The Mississippi Supreme Court found in appellee's favor, holding that the law of the state guaranteed a riparian owner the right to have the water of a stream reach his land in its natural state, or, at least, in the condition in which he was accustomed to receiving it. Any pollution of the water constitutes an actionable wrong which the riparian owner may assert in an action against the wrongdoer. In the instant case, although the oil wastes were trapped, and separation of the oil from the water was attempted by appellant, appellee's water supply was nonetheless polluted. Judgment was affirmed on the question of liability, but the case was remanded for a new trial on the issue of damages. (E Kelly-Fla)

W69-06345

POLLUTION OF FRESH WATERS.

N J Stat Ann Secs 58:10-5 to 58:10-12 (1966).

Descriptors: *New Jersey, *Water pollution control, *Legislation, *Fresh water, Potable water, Public health, Effluents, Waste water disposal, Sewage disposal, Legal aspects, Pollution abatement, Water quality control, Waste water (Pollution), Discharge (Water), Water purification, Remedies.

Identifiers: Penalties (Civil), Injunctions (Prohibitory).

No person shall discharge any polluting matter into any fresh water, or permit such discharge. 'Fresh water' includes all water commonly called fresh which may be used for human consumption. Violators shall be liable to a fine of \$50 for each offense. This fine is recoverable in an action at law if there is a failure to comply with an order to discontinue. Further necessary relief as the court shall deem proper may be obtained by a civil action. No effluent from any waste disposal or purification system shall be discharged into any potable waters of the state. Any violator may be required to construct improvements sufficient to correct the condition created by his violation, and if he refuses so to do, he may be fined \$100 per week until he complies with the order. (Harris-Fla)

W69-06349

POLLUTION OF POTABLE WATERS.

N J Stat Ann secs 58:10-1 to 58:10-4 (1966).

Descriptors: *Legislation, *New Jersey, *Water pollution control, *Domestic water, Potable water, Cities, Public health, Legal aspects, Ice, Banks, Jurisdiction, Fresh water, Pollution abatement, Administrative agencies, Water sources, Water pollution sources, Water supply, Remedies.

Identifiers: *Injunctions (Prohibitory), Penalties (Civil), Standing.

No polluting matter of any nature shall be placed or discharged in any waters, or allowed to remain on the banks or ice of any water source above the point where any municipality withdraws water for domestic use. Violators will be fined \$100 per week after notice from the Department of Health or any local department, Municipality or corporation whose source of potable water is affected by the offense. Every county district court and municipal court shall have jurisdiction over proceedings under this statute. The Department of Health has general supervisory power over all waters in the state which are a source of domestic water; the Department may examine such waters and inquire into possible pollution of them. Injunctions may be sought in a civil action by any of the parties listed above in order to prevent any actual or threatened violation of this act. (Harris-Fla)

W69-06350

PROTECTION AND IMPROVEMENT OF WATERS.

38 Maine Rev Stat Ann secs 361-454 (1965), 38 Maine Rev Stat Ann secs 361-364, 366-368, 370-371, 411, 415, 451 (Supp 1968-69).

Descriptors: *Maine, *Pollution abatement, *Water pollution, *Water pollution control, Water pollution sources, Legislation, Industrial wastes, Rivers, Coasts, Municipal wastes, Sewage, Sludge, Sewage treatment, Public health, Fish, Beneficial use, Storm drains, Water supply, Recreational facilities, Potable water, Atlantic Ocean, Surface waters.

Identifiers: Sewage surveys, Penalties (Criminal).

A commission is established with power to control and prevent pollution of the state's waters. All the waters of the state are classified according to the degree of purity which must be maintained in such waters and according to the uses to which such waters may be put. Pollution controls are established and the commission is authorized to make pollution surveys and to control the amount of sewage, either municipal or industrial, which may be placed in the waters. The commission has the power to permit limited pollution of the state's waters and to establish the standards by which such limited pollution is to be regulated. The commission is authorized to cooperate with the federal government in abating pollution and may receive federal funds when such funds are available. The Commission is explicitly empowered to enforce the provisions of this statute, and specific penalties are provided. (Shevin-Fla)

W69-06351

ORGANIZATION AND GENERAL PROVISIONS.

38 Maine Rev Stat Ann secs 361-372 (1965).

Descriptors: *Maine, *Pollution abatement, *Water pollution, *Sewage treatment, *Water pollution control, Legislation, Water pollution sources, Industrial wastes, Municipal wastes, Rivers, Coasts, Sewage, Sludge, Public health, Fish, Beneficial use, Storm drains, Sewerage, Water supply, Recreational facilities, Potable water, Atlantic Ocean, Surface water, Chemical wastes.

Identifiers: Water Improvement Comm'n.

A Water Improvement Commission is established to investigate and recommend ways and means of controlling the pollution of the rivers, waters and coastal flats of the state. The Commission is to determine the best methods of purification of disposal of wastes or drainage. Four standards of classification of fresh water are established according to the usage of the waters. Each class is also accorded minimum standards of purity for the determination of pollution abatement. Marine waters are also divided into four distinct classes. A public hearing shall be held in order to classify a particular body of water. All of the river basins of the state are specifically classified by statute. (Shevin-Fla)

W69-06352

POLLUTION CONTROL.

38 Maine Rev Stat Ann secs 411-417 (1965).

Descriptors: *Maine, *Pollution abatement, *Water pollution, *Water pollution control, *Water pollution sources, Legislation, Cities, Streams, Rivers, Lakes, Ponds, Tidal waters, Industrial wastes, Municipal wastes, Sewage, Sewerage, Permits, Public health, Surface waters.

Identifiers: Sewage surveys, Water Improvement Comm'n.

The Commission is authorized to pay an amount equal to the federal contribution to the expense of a municipal pollution abatement program. It is authorized to conduct a sewage survey for a municipality. No one is allowed to discharge wastes into any waters of the state without first obtaining a license from the Commission. The procedures for applying for a license are clearly set forth both as to classified and unclassified waters. There is a provision for an appeal from an unfavorable result on a license application. No one shall be permitted to place or deposit in the waters of the state, or on the banks so that they shall fall or be washed into such waters, any slabs, edgings, sawdust, chips, bark, slash or shavings created in the manufacture of lumber, or deposit of oil, regardless of the source, in the state's waters. The depositing of any parts of potatoes, except the pulp resulting from the manufacture of potato starch, in the waters is also specifically declared illegal. (Shevin-Fla)

W69-06353

ENFORCEMENT.

38 Maine Rev Stat Ann secs 451-454.

Descriptors: *Maine, *Pollution abatement, *Water pollution control, *Sewage, Legislation, Industrial wastes, Cities, Municipal wastes, Permits, Pollution, Injunctions, Water pollution sources, Rivers, Streams, Surface waters, Public health.

Identifiers: Enforcement, Penalties, Water Improvement Comm'n.

After adoption of any classification by the Legislature for surface waters or tidal flats, it shall be unlawful for any person to dispose of any sewage, which would have the effect of lowering the quality of the waters below the minimum requirements of such classification, regardless of any license which may have been granted. The Commission members have the authority to enter onto any lands in order to gather information regarding the pollution of waters. Any person violating the provisions of the statute may be punished by fine for each day that the violation persists. The Attorney General may issue an injunction to enjoin further violations of the statute. (Shevin-Fla)

W69-06354

BAYLEN STREET WHARF CO V CITY OF PENSACOLA (DAMAGES TO LAND BY STORM SEWER REFUSE).

For primary bibliographic entry see Field 06E.

W69-06402

POLLUTION OF WATERS BY RAILROADS AND FACTORIES.

N J Stat Ann secs 58:10-13 to 58:10-23 (1966).

Descriptors: *New Jersey, *Water pollution control, *Industries, *Railroads, Permits, Legislation, Potable water, Domestic water, Local governments, Oil wastes, Sludge, Sewage disposal, Watersheds, Water pollution sources, Industrial plants, Pollution abatement, Sludge disposal, Facilities, Water supply, Administrative agencies.

Identifiers: *Injunctions (Prohibitory), *Sludge acid, Penalties (Civil).

The Department of Health shall, on request, prescribe and fix territorial limitations where designating those parts of a railroad line or other

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public conveyances which are included in and pass over any watershed from which the public water supply is drawn. Notice of the designation sufficient to identify the territory shall be served on the railroad or its agent, and printed in public newspapers according to this statute. After adequate notice, no railroad or boat company shall discharge, or permit discharge of, any water closet or urinal within the territory. Violators shall be guilty of a misdemeanor and fined up to \$100. No factory or manufacturing concern shall be located within any potable watershed unless a permit is obtained from the Department of Health. The requirement may be waived if the concern is adequately serviced by public sewerage facilities. An injunction may issue to stop any violation of this article. No person shall permit discharge of petroleum refuse called 'sludge acid' into any water body within or bordering on the state. Any violation shall constitute a public nuisance, and be punishable as such. (Harris-Fla)
W69-06404

ATTORNEY GENERAL V CITY OF WOBURN (POLLUTION OF RIVER BY CITY).

79 NE 2d 187-189 (Mass 1948).

Descriptors: *Massachusetts, *Water pollution, *Cities, *Legislation, State governments, Pollutants, Public health, Wastes, Waste disposal, Sewage disposal, Municipal wastes, Industrial wastes, Water pollution sources, Sewage, Sewers, Pollution abatement, Legal aspects, Judicial decisions, Administrative agencies, Remedies, Rivers. Identifiers: Injunctions (Mandatory).

An information was filed by the attorney general, at the request of the Department of Public Health, seeking to enjoin the defendant city from polluting a river. The appellate court felt the evidence warranted the findings that defendant's sewer system was not adequate to meet the city's requirements. This inadequacy caused sewerage to overflow into the river, creating a condition injurious to the public health. The issue arose as to whether the statute authorizing such action by the Department of Health was applicable to a municipality. The court, taking notice of the fact that statutory use of the words 'person' or 'corporation' does not usually include a city or town, held the statute allowing the Attorney General to proceed against 'whoever' shall contaminate the river was broad enough to permit action against municipalities. The court affirmed the decree enjoining the municipality's discharge of waste into the river. (Logan-Fla)
W69-06406

POLLUTION OF WATERS.

N J Stat Ann secs 58:10-36 to 58:10-44 (1966).

Descriptors: *New Jersey, *Water pollution control, *Rivers, *Legal aspects, Jurisdiction, Cities, Waste disposal, Sedimentation, Filtration, Public health, Legislation, Pollution abatement, Water pollution sources, Water quality control, Structures, Pollutants, Effluents.

Identifiers: *Hackensack River, *Passaic River, Injunctions (Prohibitory), Penalties (Civil).

No person shall cause or permit the discharge of any offensive or pollutive matter, including dead animals, into the Passaic River or its tributaries above the Great Falls at Paterson. No person shall erect or maintain any structure, the drainage from which would tend to pollute the aforesaid waters. Violators shall be fined \$20 per day for each violation. County district courts and municipal courts shall have jurisdiction of violations. Civil actions for injunctions may be also instituted in the Superior Court to abate the pollution. No person or municipality shall, directly or indirectly, discharge any polluting matter into the Hackensack River above Bellmans Creek unless such matter is subjected to sedimentation and sand filtration treatment. For purposes of this article, 'person' means any in-

dividual, partnership, association, corporation or joint stock company, their lessees, trustees or receivers. 'Municipality' means any political subdivision of the state. (Harris-Fla)
W69-06407

DYER V SIMS (ENFORCEMENT OF INTERSTATE POLLUTION CONTROL COMPACTS).

341 U S 22-36 (1951).

Descriptors: *West Virginia, *Interstate compacts, *Interstate commissions, *Water pollution control, Ohio River, Political aspects, State governments, River basin commissions, Water resources development, Water law, Interstate rivers, Government finance, Legislation, River basins, Judicial decisions, Legal aspects.

Identifiers: State constitutions, Compact clause.

With Congressional consent, West Virginia entered into a compact with 7 other states to control pollution in the Ohio River system. They created a commission to carry out the purpose of the compact and agreed to appropriate fund to defray operating expenses. The legislature of West Virginia appropriated funds for its annual share of the compact. Respondent state auditor refused to issue a warrant upon the state treasury for payment of the appropriation. The West Virginia Commissioners to the compact brought this mandamus proceeding to compel payment. The state supreme court of appeals denied relief. The United States Supreme Court, after determining its jurisdiction to rule on compacts between states, held that the state constitution did not prohibit the legislature from delegating power to an interstate administrative agency. Nor did the compact conflict with the debt limitation in the state constitution. (Heckler-Fla)
W69-06410

Descriptors: *New York, *Water pollution, *Streams, *Diversion, Damages, Alteration of flow, Natural flow, Stream flow, Riparian rights, Natural streams, Construction, Riparian land, Obstruction to flow, Drains, Stream pollution, Silts, Sediments, Sediment discharge, Ponds.

Identifiers: Injunctions (Prohibitory).

Plaintiff resided in a dwelling situated on a landscaped plot. A stream flowed through the front lawn of the premises and emptied into a small pond. Prior to the occurrence of the acts complained of, the stream and pond contained pure and clear spring water, but, because of defendant's acts, the waters became muddy, discolored and reduced in quantity. A residue of silt, sediments and debris was deposited in the pond. Defendants were developers of a tract of land a mile upstream from plaintiff's land. They were engaged in grading the land, constructing streets, sewers and drains, and erecting homes. Defendants diverted the natural course of the stream, and caused large quantities of dirt and mud to be placed into the stream, making it clogged and stagnant. The court denied plaintiff's request for an injunction, holding that the plaintiff's right to injunctive relief depended upon proof either that the developing or building operations of the defendants caused or threatened to cause unreasonable pollution of the stream by causing or permitting debris to be deposited therein or that their operations brought about an unreasonable diminishment of the natural flow of the stream. Plaintiff failed to prove either of these facts. (Heckler-Fla)
W69-06410

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

BENEFITS FROM INTEGRATED WATER MANAGEMENT IN URBAN AREAS - THE CASE OF THE NEW YORK METROPOLITAN REGION,

Columbia Univ., New York; Barnard Coll., New York. Dept. of Geography; and Rutgers - The State Univ., New Brunswick, N. J.

For primary bibliographic entry see Field 06B.
W69-06201

MATHEMATICAL STATISTICS AS A METHOD FOR HYDROLOGICAL INVESTIGATIONS,
Research Inst. for Water Resources Development, Budapest (Hungary).

J. L. Bogardi, I. V. Nagy, and Z. Szigyarto.
2nd Int Postgrad Course on Hydrol Method for Develop Water Resources Manage, Budapest, Hung, Jan-July 1968, Manual No 7, 1968. 145 p, 16 fig, 15 tab, 4 ref.

Descriptors: *Statistical methods, *Hydrologic data, *Water management (Applied), Probability, Correlation analysis, Regression analysis, Time series analysis, Estimating, Least squares method, Statistical models, Stochastic processes, Synthetic hydrology, Parametric hydrology, Monte Carlo method, Markov processes.

Identifiers: *Textbooks, *Technical manuals.

The use of statistical methods in hydrological investigations is given in a technical manual presented as a chapter of a text written for an international postgraduate course in water resources management. The statistical principles and methods included are discussed in sufficient detail for use in solving most hydrological problems requiring their use. The topics considered are the fundamentals of probability theory and mathematical statistics, probability estimation, principles of correlation, computation of correlation, synthetic hydrology, and instruction in application of statistics to hydrology. The practical applications covered are: computation, curve fitting, and correlation of parabolic relationships, hyperbolic rela-

ANTHONY V HUNTER ESTATES (DAMAGES FOR POLLUTION OF STREAM).

137 N Y S 2d 664-667 (S Ct 1954).

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tionships, and exponential relationships; extension of short data series; and analysis of extreme values in hydrological records. (Knapp-USGS)
W69-06226

HYDROLOGY OF LAND DRAINAGE,
Research Inst. for Water Resources Development,
Budapest (Hungary).
For primary bibliographic entry see Field 04A.
W69-06234

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER IV: INTANGIBLES, UNCERTAINTY, AND CRITERIA,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 06B.
W69-06293

6B. Evaluation Process

RECREATIONAL VALUE OF WATER AT ELEPHANT BUTTE AND NAVAJO RESERVOIRS,

New Mexico State Univ., Las Cruces.
Robert O. Coppedge, and James R. Gray.
Agricultural Experiment Station Bulletin 535, October 1968. 25 p., 18 tab, 5 fig, 6 ref. OWRR Project B-001-NMEX.

Descriptors: *Outdoor recreation, *Water value, *Recreation demand, Economic value, Elasticity of demand, Mathematical models, Water level fluctuations, Boating, Water skiing, *New Mexico, Southwest.

Identifiers: *Water level effects, Anderson-Gray Method, Effective market demand.

The quantity of water lost to seepage and evaporation from two major reservoirs in New Mexico attributable to recreational activity varied from 4,000 in the first five months of the year to 26,796 acre-feet in the last seven months. Based on the expenditures of recreationists using the reservoirs, the recreational value of water varied from \$394 to \$562 per acre-foot. Five different methods were used to calculate the annual recreational values of water. Results indicate the values varied from \$195 to \$1,065, depending on the method used. Effective market demand for recreation is more elastic in the early than in the latter part of the season. The newer reservoir has a more inelastic demand for recreation than the older established reservoir. Additional study is needed to separate the effects of water levels on recreational use in reservoirs in New Mexico from the seasonal effects.
W69-06010

GOALS AND PERSPECTIVES IN WATER RESOURCES PLANNING,
Office of Science and Technology, Washington, D. C.; and Cornell Univ., Ithaca, N. Y. Water Resources Center.

Leonard B. Dworsky, and David J. Allee.
Proc Water Resources Planning Conf, May 16-17, 1968, Boston, pp 3-25, 1968. 23 p, 1 ref.

Descriptors: *Planning, *Water resources development, New England Interstate WPS Compact, Interstate, International commissions, Decision making, River basin development, Water pollution control, Social aspects, Legal aspects.

Identifiers: Synoptic planning, Fragmented planning.

Two contrasting concepts of planning and policy making are summarized as the synoptic model and the fragmented incrementalist model. In synoptic planning it is assumed that the planner has a good enough overall view of society to allocate social resources wisely. In the fragmented view, planners have options only within their narrow fields of specialty and present society with unrelated programs in competition for selection. It is suggested that as

these modes are points on a continuum of management possibilities, a synthesis might be possible. In reality, this is often the case; some planners are more synoptic and some more fragmented. Recent trends are toward the synoptic. Special attention is given to U.S.-Canadian water resource cooperation, the Water Resources Council, and the U.S. water pollution planning program. A stronger federal control is developing and interstate cooperation is increasing. More attention must be given to U.S.-Canadian cooperation in planning, to prevent inefficiency and promote maximum benefits to both countries. (Knapp-USGS)
W69-06046

WATER RESOURCES PLANNING STRATEGY,
Office of Water Resources Research, Washington, D. C.
E. D. Eaton.
Proc Water Resources Planning Conf, May 16-17, 1968, Boston, pp 27-60, 1968. 34 p, 16 ref.

Descriptors: *Planning, *Water resources development, *New England Interstate WPS Compact, Future planning (Projected), Decision making, Systems analysis, Computers, Economics, Social aspects.

Identifiers: Planning strategy.

Planning operations and difficulties, ways of attaining planning objectives, and the limitations of water resources planning are discussed. Water resources planning is hazardous because it deals with imperfectly understood physical processes and even less understood human behavior. Failure wastes vast amounts of money and deteriorates living conditions for great numbers of people. Planning with incomplete information is nearly always necessary. The strategy of such planning is exactly the same as that of theoretical science or inductive reasoning. Available data are used to generate multiple working hypotheses, which are then tested against reality and rejected or modified as necessary. The final result is a conceptual model against which decisions may be tested. Computers may be used to handle data, but man must make the decisions, because in computer decisions, only programmed factors are examined, whereas a human decision takes in a great range of experience or data invariably considered irrelevant or too complex for inclusion in a computer program, but critical for good decision. A desirable test as well as a criterion for decisions is the democratic process. The various interstate compacts and basin commissions are an expression of a recent trend in this direction. (Knapp-USGS)
W69-06047

TECHNOLOGY AND PUBLIC DECISION MAKING,

Cornell Univ., Ithaca, N. Y. Center for Environmental Quality Management.

Walter R. Lynn.
Proc Water Resources Planning Conf, May 16-17, 1968, Boston, pp 61-71, 1968. 11 p. Grant ES-00098.

Descriptors: *Decision making, *Planning, *New England Interstate WPS Compact, Economics, Social aspects, Political aspects, Psychological aspects, Data collections, Programs.

Identifiers: Role of technology in planning.

The role of the technologist in public decision making in the solution of water resources problems is surveyed and general recommendations are made of the types of alternatives to be supplied to the decision-making person or political body. If an alternative is recommended by the technologist, then the value system by which he made the choice must be specified in detail; otherwise he must restrict himself to listing alternatives only in terms of possible choices and means of achievement. Social and technical judgments must be separated carefully so that technologists do not preempt public policy decisions and politicians do not make technical judgments. Uncertainty and risk must be clearly marked. (Knapp-USGS)

W69-06048

WATER RESOURCES PLANNING,

Gordon L. Byers.
Proc New England Counc Watér Center Dir, Boston, May 16-17, 1968. 105 p.

Descriptors: *Planning, *Water resources development, *New England Interstate WPS Compact, Interstate, Future planning (Projected), Decision making, Systems analysis, Economics, River basin development, Social aspects, Legal aspects.

Identifiers: Symposium, Planning conference.

A water resources planning conference was held in Boston, May 16-17, 1968, to identify problems in water resources planning and to develop information helpful in solving these problems. The topics of the papers presented are: goals and perspectives in water resources planning, planning strategy, technology and public decision making, economic considerations, and institutional factors. The relations between technologists, social planners, construction agencies, local governments, State governments, and the Federal government are examined to learn the actual course of decision making. (Knapp-USGS)
W69-06049

MOUNTAIN AND DESERT LAKES IN SOUTHERN KAZAKHSTAN, THEIR RESOURCES AND METHODS OF ECONOMIC DEVELOPMENT,

For primary bibliographic entry see Field 02H.
W69-06073

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT.

National Academy of Sciences--National Research Council, Washington, D. C. Committee on Water.

National Academy of Sciences, Publication 1689, Washington, D. C., 1968. pp 1-65.

Descriptors: Administration, *Decision-making, *Planning, *Methodology, Model studies, *Non-structural alternatives, *Colorado River Basin.

The report provides a concrete example of the alternatives approach to water management, the theory of which was outlined in an earlier report, Alternatives in Water Management. Colorado River basin and the state of Arizona are selected for illustration. The first chapter (pp 1-4) emphasizes that scientific analysis must allow for potentially practicable alternatives. It states two recommendations toward which the report builds: (1) investigations needed to expand the range of choice for planning purposes in the Colorado basin, thus suggesting a kind of analysis that should be fruitful in any basin; and (2) those designed to improve the planning and decision-making processes. (Gossin-Chicago)
W69-06086

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT, CH. 2, THE SETTING.

National Academy of Sciences--National Research Council, Washington, D. C. Committee on Water.

National Academy of Sciences, Publication 1689, Washington, D. C., 1968. pp 5-31, 6 fig, 1 tab.

Descriptors: Arizona, Colorado River, *Colorado River basin, Crop production, *Environmental effects, Economics, Human population, Scenery, *Land use, *Land resources, Water control, Climatic zones, Arid lands, *Federal jurisdiction, *State jurisdictions, Prior appropriation, Mexican Water Treaty, Colorado River Compact, Salinity. Identifiers: Central Arizona Project, Pacific Southwest Water Plan, Lower Colorado River Basin Project, Water rights conflicts between states.

Chapter Two describes: aridity of the basin, its agricultural use, the river's flow and sediment, the range of ecological zones through which the river passes, the Grand Canyon, population growth, economic growth, due mainly to industry, exploitable mineral reserves, the high degree of river control, the water quality problem, mainly one of salinity, and falling groundwater levels. All of these characteristics restrict alternatives for allocation of water. The extensive legal control of the area is not analyzed comprehensively; it is outlined, and controversies that limit alternatives are discussed. Legal aspects covered include the Colorado River Compact, allocations among states, the Mexican Treaty Obligation, the Supreme Court case of Arizona vs. California, the Central Arizona Project, the Pacific Southwest Water Plan, the Lower Colorado River Basin project, and the controversy over proposals for importation of water from the Pacific Northwest. (Gossin-Chicago)

W69-06087

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT, CH. 3, PROBLEMS OF WATER SUPPLY IN THE BASIN.

National Academy of Sciences—National Research Council, Washington, D. C. Committee on Water.

National Academy of Sciences, Publication 1689, Washington, D. C., 1968. pp 32-40.

Descriptors: *Colorado River basin, Colorado River, Arizona, Water quality control, *Water supply, Water sources, Planning.

Identifiers: Climatic fluctuations.

Quantity and quality of water, and present and future use patterns of the area must be studied before economic and social impacts of future water development can be assessed. The chapter gives various explanations for the uncertainty in estimates of average flow and of extent of variation in flow: fluctuation in flow, steadily decreasing flow, error in measurement, error in method of calculation, and ecological change. The causes of climatic fluctuations are discussed. The chapter recognizes at least three alternatives for full utilization of the river's water: (1) to allow regional development to adjust to available water supplies; (2) to seek new sources of water; and (3) to reduce consumptive uses and wastage and to increase the reuse of water. Knowledge of physical conditions and their social implications is so limited that it prevents detailed comparison of the choices. New developments increasing the feasibility of obtaining water from new sources are discussed. The necessary bases of a water-quality control program for the basin are defined. The chapter recommends future study on control of natural salt sources, reduction of salt input in irrigated areas, reduction of consumptive water use, and the methods and costs of control. (Gossin-Chicago)

W69-06088

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT, CH. 4, THE RANGE OF OBJECTIVES IN PLANNING FOR THE USE OF COLORADO WATER.

National Academy of Sciences—National Research Council, Washington, D. C. Committee on Water.

National Academy of Sciences, Publication 1689, Washington, D. C., 1968. pp 41-58, 1 fig.

Descriptors: Methodology, *Economic efficiency, Control, Scenery, Short-term planning, *Water utilization, *Multiple-purpose projects.

Identifiers: Public aims, Income redistribution, Political obligations.

Contemporary aims of water management have three weaknesses: (1) diversity, (2) ambiguity, and (3) changeability. When aims are diverse and ambiguously stated, there is rarely a rigorous examination of alternative ways to reach any of the aims. When aims change, research that once seemed

relevant becomes inadequate. The chapter classifies public aims for the Colorado basin as follows: (1) national economic efficiency; (2) income redistribution; (3) satisfying political obligations; (4) controlling the natural environment; and (5) preservation and esthetics. The chapter examines each of these classes and their relationships to each other. The first is most often a guide for evaluating programs based on the others. The chapter suggests the extensive range of alternative solutions for a number of different goals in the Colorado basin. (Gossin-Chicago)

W69-06089

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT, CH. 5, ALTERNATIVES FOR PROMOTING REGIONAL ECONOMIC GROWTH.

National Academy of Sciences—National Research Council, Washington, D. C. Committee on Water.

National Academy of Sciences, Publication 1689, Washington, D. C., 1968. pp 59-65.

Descriptors: Arizona, Short-term planning, Future planning (Projected), Economic life, *Investment, *Colorado River basin.

Identifiers: Employment effects, *Regional economic growth.

It is often assumed that water development is essential for local and regional economic growth, but Chapter 5 examines several alternatives for Arizona: (1) Investment in educational institutions with high quality research facilities as a way to attract industry to an area; (2) investment in primary and secondary schools, which train a labor force; (3) investment in such government services as highways and hospitals is considered as it relates to population and income growth; and, (4) investment in industry itself has great income and employment benefits, but the mobility and private ownership of industry may discourage such an investment. The committee prefers a balanced program to any single means. Employment effects of non-agricultural growth are considered. Two major points are stressed: (1) If the economic growth of the state is the aim, alternative forms of investment may yield larger returns at the moment and in the near future than investment in new water supply; and (2) thorough investigation of these alternatives calls for accelerated research on the sectoral and spatial characteristics of regional growth. (Gossin-Chicago)

W69-06090

A FLOOD LOSS REDUCTION PROGRAM, For primary bibliographic entry see Field 06F.

W69-06097

METROPOLITAN PROBLEMS: METROPOLITAN PUBLIC AUTHORITIES,

Drew Univ., Inst. for Research on Government.

Robert G. Smith.

Lecture Series, Drew University, Institute for Research on Government, Fall 1963, pp 33-42. 9 p.

Descriptors: Local governments, Financing, *Inter-agency cooperation, Political aspects, Legal aspects, Administrative agencies, Governments.

Identifiers: *Public authorities, Special districts, County governments.

Organization of special districts and public authorities and classification of different units of government need further refinement. The distribution between special districts and public authorities is discussed. Within the public-authority classification itself there are two broad categories: one reaches across existing boundaries to service functions that have not confined themselves to arbitrary boundaries; the other shares boundaries with existing local governments. The latter type are single-purpose authorities created to meet needs occasioned by population shift into suburbs. They are

being established in greater numbers than the first type. Discussion is focused on their constituencies, then representation, and then accountability in general. They depend almost completely upon bonding. Legislation protecting the bondholder may turn the agency into a vast private power. Also to protect the bondholder, a public authority committed to one specific function must continue to pursue it. The most striking effect on local governments is fragmentation of governmental responsibilities. Elimination of public authorities cannot be visualized, but in the future we should use established governments, especially counties, for these functions. The proposal of the Advisory Commission on Intergovernmental Relations to establish "metropolitan service corporations" offers many improvements on the public-authority structure, and needs further study. (Gossin-Chicago)

W69-06098

METROPOLITAN PROBLEMS: THE DELAWARE RIVER BASIN COMMISSION,

Delaware River Basin Commission, Trenton, N. J.

James F. Wright.

Lecture Series, Drew University, Institute for Research on Government, Fall, 1963, pp 55-66. 12 p.

Descriptors: *Delaware River Basin Commission, Programs, *Project planning, Water quality control, History, Inter-agency cooperation, *Water demand, *Water supply, Human population, Recreation demand, Electric power demand, Flood protection, Research and development.

Identifiers: *Delaware River Basin Commission Compact, *Comprehensive program planning.

After briefly describing the historical basis for the Delaware River Basin Commission Compact and the Commission thereby created, the report discusses important features of the Compact, the Commission's staff organization, its objectives, and its problems. Articles I, II, III, and Sections III.3, III.6, and III.8 of the Compact are emphasized. The other articles are described briefly. The majority of Commission staff is in the planning division, which has three branches: program planning, project review, and water quality. The duties of each branch are discussed. The Commission's foremost objective is to develop comprehensive plans and to keep them current. Comprehensive planning includes multi-purpose physical projects and identification of an area's goals. Nine basic planning programs include: a continuing inventory of water supply; population analysis and study of water and land demands; analysis of fish and wildlife and study of recreation demands; analysis of power potential and demand; investigation of projects proposed by others; studying the adequacy of water quality standards; integrating studies into a comprehensive plan; flood loss reduction; and, planning basin operation development. Three major problems are: intergovernmental relations; marking new water; and developing the most effective water quality plan that can be implemented. (Gossin-Chicago)

W69-06099

BENEFITS FROM INTEGRATED WATER MANAGEMENT IN URBAN AREAS - THE CASE OF THE NEW YORK METROPOLITAN REGION,

Columbia Univ., New York; Barnard Coll., New York, Dept. of Geography; and Rutgers - The State Univ., New Brunswick, N. J.

Leonard Zobler, George W. Carey, Michael R. Greenberg, and Robert M. Hordon.

Available from Clearinghouse as PB 184 019; \$3.00 in paper copy and \$0.65 in microfiche. Columbia Univ.-Barnard Coll Final Rep to OWRR, Dep of Interior, Apr 1969. 346 p, 38 fig, 24 tab, 69 ref, 10 append. OWRR Grant No. 14-01-0001-1583.

Descriptors: *Water management (Applied), *Water distribution (Applied), *Distribution systems, *Mathematical models, *New York, Com-

Field 06—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

puter models, Linear programming, Optimization, Systems analysis, Networks, Dynamic programming, Public utilities, Water delivery, Water demand, Urbanization, Water shortage, Optimum development plans. Identifiers: *New York Metropolitan Region, Water distribution network.

The water delivery systems of the New York Metropolitan Region were analyzed hydrologically and topologically for mathematical modeling and computer simulation to study the composite performance of the regional 'system' during a period of stress, the 1962-1966 drought. There are over 400 separately managed and partly connected water agencies in the region, and 16 million customers. To study overall behavior in the drought period, and to make future projections, 3 models were made: An input-output flow model to trace water movement and calculate transfer coefficients; a linear program that used the transfer coefficients to stipulate water exchanges among the agencies; and a linear program that used flexible transfer coefficients and a weighted objective function to direct water surpluses to specified agencies. The network response to projected demands and supplies was observed in 5-yr intervals from 1970-1985 as a system and by individual agencies. In the past and projected droughts, the network was vulnerable to stress. Some agencies were short of water while others had surpluses. This weakness could be relieved by flexible transfer, developing new links to meet needs. With modest source increases, 1985 projected demand could be met. It is concluded the real-world system was not optimal. The optimization program yielded specific design recommendations to improve distribution and to optimize location and timing of new input. Beyond 1985, major subregional transfers will be necessary. An alternative is the development of major new water sources, such as desalination. More system integration is needed to solve present input-variability problems. The models developed may be adapted to any other complex water distribution networks. (Knapp-USGS)

W69-06201

RESERVOIRS: PROBLEMS AND CONFLICTS, Emery N. Castle.

Partially supported by OWRR-Dept of Interior, Water Resources Res Inst Seminar, Fall Quarter 1968, Oregon State Univ, Jan 1969. 127 p, 5 fig, 4 chart, 1 tab, 65 ref.

Descriptors: *Water management (Applied), *Reservoir operation, *Competing uses, *Columbia River, Management, Electric power, Fish management, Recreation, Flood control, Irrigation, Navigation, Water allocation (Policy), Eutrophication, Cost-benefit, Analysis, Water utilization, Governments, Watershed management. Identifiers: Reservoir use conflicts.

A seminar held at Oregon State University in 1968 discusses the problems and conflicts of reservoir management in 12 published papers. Their topics are the basis of conflict, upstream watershed management, forest management, eutrophication, water losses, fisheries, water temperatures, payment and benefits, recreation, water use, role of the State, and public issues on the Middle Snake River. Conflicts between competing uses are examined in papers intended for the general non-specialist reader. Although most of the papers concern problems of Washington and Oregon, and particularly Columbia River and tributary reservoirs, the conflicts discussed are general and appear everywhere streams are regulated. The basis of the greatest number of problems in water levels, Recreation demands a constant water level, flood control demands minimum levels, power production demands maximum feasible head with maximum reliability of supply, and irrigation demands maximum pre-season storage. In multiple-use reservoirs these aims are usually in total conflict, so drastic compromise is necessary. Other conflicts arise in water temperature, water quality, and stream-flow regulating effects of reservoirs. (Knapp-USGS)

W69-06207

MINERAL TASTE IN DOMESTIC WATER,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 05E.
W69-06215

W69-06230

HYDROLOGY OF WATER STORAGE,
Research Inst. for Water Resource Development, Budapest (Hungary).
For primary bibliographic entry see Field 02E.
W69-06231

ECONOMIC EVALUATION OF WATER-PART IV: AN INPUT-OUTPUT AND LINEAR PROGRAMMING ANALYSIS OF CALIFORNIA WATER REQUIREMENTS.

California Univ., Berkeley. Sanitary Engineering Research Lab.; and Calif. Univ., Berkeley. School of Public Health.

E. M. Lofting, and P. H. McGauhey.
Calif Univ Water Resources Center Contrib No 116, Aug 1968. 187 p, 8 fig, 11 tab, 158 ref, 9 append. OWRR No. 14-01-0001-886.

Descriptors: *Water values, *Optimization, *Systems analysis, Water demand, Water utilization, Water costs, California, Economics, Linear programming, Computer programs, Digital computers, Forecasting, Optimum development plans. Identifiers: *California economic model.

A model of the California economy uses linear programming as an optimizing technique to calculate the real value of water for optimum distribution of the development at 24 productive water-using economic sectors. The model is based on national and California economic data of 1958. Economic and population projections to 1990 were based on the period 1940-1966. Computer program listings and printouts of 3 solutions for water withdrawals of 43, 52, and 66 million acre-ft/yr are tabulated. (Knapp-USGS)

W69-06220

HYDROLOGICAL ASPECTS OF WATER MANAGEMENT,

Research Inst. for Water Resources Development, Budapest (Hungary).

Gy Kovacs.
2nd Int Postgrad Course on Hydrol Method for Develop Water Resources Manage. Budapest, Hung, Jan-July 1968, Manual No 2, 1968. 59 p, 22 fig, 5 tab.

Descriptors: *Water management (Applied), *Water resources development, *Hydrologic aspects, Government, Planning, Urbanization, Water conservation, Flood control, Channel improvement, Irrigation, Water supply, Sewage, Waste disposal, Hydroelectric power, Economics. Identifiers: Textbooks, Technical manuals, Lecture notes.

Water management is defined and the hydrological aspects of water management are discussed in the introductory section of a text written for an international post-graduate course in water resources management. The topics introduced are flood control, river training, water control on the catchment, irrigation, water supply and sewage problems, water power, and economics. The objectives of water management and the needs for data of the various branches of water management are outlined and summarized. Various national water management organizations and policies are briefly described. (Knapp-USGS)

W69-06221

ESTIMATION OF SURFACE-WATER RESOURCES,

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 02E.

W69-06229

ESTIMATION OF GROUNDWATER RESOURCES,

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 02F.

MAN'S INFLUENCE ON HYDROLOGICAL PHENOMENA,

Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 04C.
W69-06233

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT,

Rand Corp., Santa Monica, Calif.

Roland N. McKean.

Publications in Operations Research No. 3, John Wiley and Sons, Inc., New York, March, 1967. 336 p.

Descriptors: *Decision making, *Systems analysis, *Analytical techniques, Economic efficiency, Governments, Methodology, Cost-benefit theory.

Using systematic quantitative analysis to compare alternatives should increase governmental economic efficiency. However, for the analysis to benefit the nation's economy, analytical methods must be improved and use of the analysis must be extended. The report discusses the usefulness and development of analytical aids in economic decision making. Discussing the application of analytical aids in government, the report describes the need for systems analysis, alternative procedures, and the impact of systems analysis upon economic decision making. An example of the approach is cost-benefit analysis, which is most used in designing water resource programs. The importance of cost-benefit analysis and its history are described. Possible improvements in its methodology are suggested. The study also proposes to consider general methodological problems of systems analysis, specific problems in water resource analysis, case studies of two analyses prepared by federal agencies, and potential use of analysis in several government activities. The purpose of the study is to suggest improvements and further applications of systems analysis. (Gossen-Chicago)

W69-06290

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTERS I-II: INTRODUCTION; THE CRITERION PROBLEM,

Rand Corp., Santa Monica, Calif.

Roland N. McKean.

John Wiley and Sons, Inc., New York, pp 3-49, March, 1967. 45 p, 2 tab, 61 ref.

Descriptors: *Decision making, *Methodology, *Economic efficiency, *Cost-benefit theory, Budgeting, Cost allocation, Inter-agency cooperation.

Adequate criteria for choosing among alternatives are discussed, including situations which allow use of partial criterion, and situations which demand a definitive test of preferredness. The chapter distinguishes workable criteria from ultimate objectives. It examines in detail the problem of erroneous criteria, discussing the division of an analysis between groups of people and chunks of time, levels of authority in decision making and possible advantages of dividing a single analysis. An important danger is that lower-level decision-makers may adopt criteria unrelated to the aims of upper-level authorities. Some common criterion errors are classified and exemplified, including the idea of simultaneously maximizing gain and minimizing cost or of maximizing two alternative gains, overlooking the absolute size of gain or cost, setting the

wrong size of gain or cost, neglecting the impacts of one agency's action upon other agencies' gains or costs, and using wrong concepts of gain or cost. Suitable criterion forms including maximizing gains minus costs, if the two are measurable in the same unit, and fixing either gain or cost. (Gossen-Chicago)
W69-06291

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER III: THE APPROPRIATE ALTERNATIVES,
Rand Corp., Santa Monica, Calif.
Roland N. McKean.
John Wiley and Sons, Inc., New York, pp 50-57, March 1967. 8 p, 3 ref.

Descriptors: *Systems analysis, *Methodology, Optimization, Creativity, Operations research, Inter-agency cooperation.
Identifiers: *Alternative actions, *Methodologic criteria.

Alternatives which should be compared are considered; Relevancy of alternatives to their contexts is discussed. Alternative actions differing in nature and in scale, and interrelationships among the courses of action are also considered. Although it is impossible to formulate clear-cut rules, the chapter draws several conclusions. (1) The system calling for possible actions, and hence the level of optimization is related to the criteria devised. Definition of systems and devising of criteria should go hand-in-hand; (2) designing and redesigning alternative courses of action in operations research demand ingenuity; (3) in designing alternative policies, different scales of each project and various combinations of measures are relevant. The addition or removal of extra features or increments in size creates additional alternatives; (4) if more than one of the actions may be taken or if actions are to be ranked for future reference, interrelationships between alternative plans must not be neglected; and (5) researchers must remain constantly aware of the limitations of analysis carried out in different parts by different agencies. Therefore, results must be interrupted critically. (Gossen-Chicago)
W69-06292

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER IV: INTANGIBLES, UNCERTAINTY, AND CRITERIA,
Rand Corp., Santa Monica, Calif.
Roland N. McKean.
John Wiley and Sons, Inc., New York, pp 58-73, March, 1967. 16 p, 1 tab, 13 ref.

Descriptors: *Intangible benefits, *Intangible costs, Decision making, Systems analysis, Operations research, Psychological aspects, Project purposes, Governments, Regional benefits, Preservation.
Identifiers: *Methodologically-linked deficiency.

The non-quantitative aspects of criteria are discussed, and how they complicate the criterion problem. Intangible gains and costs are discussed. Examples of intangibles include the effect of a water resource project on the size of the government, 'balanced' regional development, preservation of natural assets apart from consequences for future production, and many others. Analysis must inform decision-makers of the intangible effects of an action. Another non-quantitative consideration is the degree of uncertainty about an action's cost and benefit. Alternative ranges in costs and benefits, which have different values for different decision-makers, should be explored. The researcher's psychological reactions to uncertainty must not prevent him from recognizing it. Types of uncertainty pervade analysis, including uncertainty about specified gains and costs, about 'given' parts of systems, about the responses of other decision-makers, about technological change, and about the

chance element in recurring events. Although use of quantitative indicators is not always possible, concise description of uncertainty must be presented to decision-makers. The existence of intangibles and uncertainty implies partial tests rather than the ideal definitive test as criterion. (Gossen-Chicago)
W69-06293

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER V: TIME STREAMS AND CRITERIA,
Rand Corp., Santa Monica, Calif.
Roland N. McKean.

John Wiley and Sons, Inc., New York, pp 74-95, March 1967. 22 p.

Descriptors: *Time, *Cost-benefit theory, *Methodology, Costs, Benefits, Investment, Capital, Fixed costs, Decision making, Discount rate, Timing, Value.

Identifiers: *Methodologic criteria, Accrual dates, Resale value, Return.

The relationship of time streams to criteria is examined. Cut-off date of cost and gain estimates is discussed. The bulk of the chapter discusses how to treat costs and gains accruing at different dates. One method is to discount future amounts of gains minus costs and covert each time stream to its present value. Circumstances in which this method is appropriate are discussed at length. They include situations in which the investment budget can be varied by borrowing money, situations in which capital is fixed, and situations in which capital is fixed and resale value irrelevant. To implement this method for decision makers the analyst should show the present value of cost-gain streams at many discount rates for a few project sizes and for a few combinations of projects. Another method is ranking the projects by internal rate of return. The difficulty of handling interrelated projects with this method is discussed. Ranking by other rates of return is discussed. If gain or cost is measured in physical rather than monetary units, the most satisfactory method is to fix either the gain or the cost. Future costs should be discounted. In many cases, the researcher must specify a particular time path. (Gossen-Chicago)
W69-06294

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER VI: WHAT CAN BE DONE: A RECAPITULATION,
Rand Corp., Santa Monica, Calif.

Roland N. McKean.
John Wiley and Sons, Inc., New York, pp 96-100, March, 1967. 5 p.

Descriptors: *Cost-benefit analysis, *Methodology, *Test procedures, Decision making, Costs, Benefits, Time.

Identifiers: Methodologic criteria, Alternative actions, Intangibles, Methodologic deficiency.

This chapter is a convenient reference for suggestions, relating to cost-benefit analysis, which appear throughout the book. In answer to general criterion-difficulties, McKean warns against particularly treacherous tests, suggests generally suitable forms of criterion, warns that criterion must be consistent with higher-level criteria, and warns against erroneous concepts of cost or gain. In seeking appropriate alternatives, researchers should compare the scope of their systems with the criterion selected; pay attention to the devising of alternatives as well as to their comparison; and watch for effects that policies may have on each other. Regarding intangibles, there are apparent intangibles that may be measurable; if immeasurable, researchers should devise indicators of the magnitude and nature of major intangibles. Regarding uncertainty, researchers should show probable ranges of outcome, present the change in results

that would occur from some alteration of the system, or at least emphasize major contingencies substantially affecting outcomes. Researchers should calculate the chance element, and look for a recurring situation which demands a particular action. Regarding time streams, a researcher should discount the streams to their present value or specify the time path and discount the cost stream. While interpreting, researchers should consider limitations of their analytical method. (Gossen-Chicago)
W69-06295

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER VIII: KINDS OF BENEFITS AND COSTS; SPILLOVER EFFECTS,
Rand Corp., Santa Monica, Calif.
Roland N. McKean.

John Wiley and Sons, Inc., New York, pp 134-150, March 1967. 17 p, 9 ref.

Descriptors: *Cost-benefit analysis, Economics, Decision-making, Input-output analysis, Adjusted prices, Salaries, Investment, Methodology, Operations research.

Identifiers: *Spillover effects.

The implications of spillover effects for cost-benefit measurements are examined. Spillover effects are defined as effects of some decision-making units on the activities of others; these effects may be either economics or diseconomies. Technological spillovers are spillovers which effect the physical outputs or the satisfaction that other producers or consumers can get from their physical inputs. Cost-benefit measurements should allow for major technological spillovers. Pecuniary spillovers do not effect the units of output or satisfaction over input, but are external effects occasioned by shift in prices. Four types of pecuniary effects include bidding up factor rates of hire, cutting down prices of substitute products, raising prices of complementary products, and lowering the price of the output. Pecuniary spillovers should not be taken into account in the comparison of projects. McKean discusses repercussions on the profitability of a proposed investment, as well as which repercussions should be considered, and how to estimate them. He clarifies the distinction between technological and pecuniary spillovers, and discusses the consistency of his views with the position that national income should be maximized, the common-sense position regarding duplicate facilities, and official positions. (Gossen-Chicago)
W69-06296

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER IX: KINDS OF BENEFITS: OVER-COUNTING, AND SECONDARY BENEFITS,
Rand Corp., Santa Monica, Calif.

Roland N. McKean.
John Wiley and Sons, Inc., New York, pp 151-167, March 1967. 17 p, 16 ref.

Descriptors: *Methodology, *Cost-benefit analysis, *Benefits, *Federal budgets, Costs, Economic efficiency, Employment Regional analysis, Taxes.
Identifiers: Spillover effects, Incremental outputs.

Errors in calculating the value of benefits are discussed; Examples of double counting are given. A method of counting costs and benefits is given, and is compared to the Federal estimation procedure described in the 'Bureau of Reclamation Manual' of March, 1952. The Federal procedure of counting secondary benefits, the inconsistency of the manual's terms, and the relationship of secondary benefits to spillovers are described. The bulk of the chapter discusses secondary benefits as gains to the waste economy. Situations occurring in private firms of fully employed resources and of partially employed resources, are considered. Implications for cost-benefit measurements are

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discussed. McKean examines the recommendation of the Federal Inter-Agency River Basin Committee for the treatment of secondary benefits. His position is that, to help determine the composition of water-resource budgets, benefit measurements should be confined to the values of the incremental outputs. In determining the magnitude of the budget, the effects on employment should be considered, since they can be estimated reliably. Secondary benefits as measures of regional development and treatment of taxes is discussed. Consideration of miscellaneous errors which lead to over-counting complete the chapter. (Gossen-Chicago)

W69-06297

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER X: VALUATION OF BENEFITS, Rand Corp., Santa Monica, Calif.

Roland N. McKean.

John Wiley and Sons, Inc., New York, pp 168-182, March 1967, 15 p, 3 fig, 7 ref.

Descriptors: *Value engineering, *Benefits, *Prices, *Cost-benefit analysis, Investment, Unit costs, Cost comparisons, Economic efficiency, Distribution, Methodology, Operations research.

Identifiers: General price level.

The chapter discusses how to measure the value of benefits. The first topic is valuation of indivisibilities are present. So long as investment proceeds by small increments, the value of the output attributable to the investment is simply the price of an extra unit. However, if the investment on any factor of production can be provided only in a 'large lump,' it may lower price per unit. Alternative methods of measuring the value of the product to the consumer are disproved and a general method recommended. Efficiency and distributional considerations are discussed. Comparing individual projects, a process that demands cost-benefit measurements, is discussed. The second topic is valuation if actual charges will differ from incremental cost. Situations of output reaching its capacity and of deliberate under-pricing are considered. The third topic is alternative justifiable expenditure as a price. Sometimes, when an output is particularly hard to value, researchers assume benefits equal to the cost of the cheapest alternative way to produce the same service. Advantages and dangers of this procedure are discussed. The fourth topic is valuation and movements of the general price level. General price changes have a calculable effect on the comparison of projects. (Gossen-Chicago)

W69-06298

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER XI: CASE STUDY I: THE GREEN RIVER WATERSHED, Rand Corp., Santa Monica, Calif.

Roland N. McKean.

John Wiley and Sons, Inc., New York, pp 185-213, March, 1967, 29 p, 8 tab, 2 ref.

Descriptors: *Methodology, *Basins, *Project planning, *Cost-benefit analysis, Project purposes, Project benefits, Channel improvement, Flood control, Land reclamation, Land development, Cost analysis, Prices, Time.

Identifiers: *Green River Watershed, *Department of Agriculture.

The methodological content of earlier chapters are related to a case study of the Green River Watershed. The program recommended for the watershed by the Department of Agriculture in 1951 is examined. The stated objectives of the program were the alleviation of flood and sediment damages, although the benefits were actually increases of output. The model which it used to estimate benefits is discussed in six parts showing the effects of: channel improvement on peak stages of

floods; channel improvement on flood damage; land treatment on peak stages of floods; land treatment on flood damage; land treatment on sedimentation; and land treatment on crop yields and farm income. Cost models, adjustments for relative price changes, and treatment of time in the project are discussed. Changes in cost-benefit analysis are suggested with reference to the Green River Watershed. Changes in the general criterion, the scope of the analysis, treating projects as lumps or small increments, time streams, exhibition of factors of uncertainty and ranges, estimation procedures, secondary benefits, distribution of wealth, and criterion for ranking projects are suggested. (Gossen-Chicago)

W69-06299

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS, WITH EMPHASIS ON WATER RESOURCES DEVELOPMENT, CHAPTER XII: CASE STUDY II: SANTA MARIA PROJECT, Rand Corp., Santa Monica, Calif.

Roland N. McKean.

John Wiley and Sons, Inc., New York, pp 214-244, March 1967, 31 p, 1 fig, 9 tab, 5 ref.

Descriptors: *Methodology, *Project planning, *Cost-benefit analysis, *Systems analysis, Project benefits, Irrigation programs, Flood protection, Reservoirs, Water supply, Net income, Channels, Levees, Costs, Time, Cost comparisons.

Identifiers: *Santa Maria Valley, *Army Corps of Engineers, *Bureau of Reclamation.

This chapter relates the methodological content of the first ten chapters to a case study of the Santa Maria Project. The Bureau of Reclamation and the Corps of Engineers planned jointly the irrigation and flood-protection program for California's Santa Maria Valley. Models that describe the project's benefits are described in parts showing the effects of: reservoir on water supply; reservoir on net farm income; reservoir and channel-levee works on flood damage; and secondary benefits. The project's costs, its treatment of time, and its criterion are discussed. Changes in cost-benefit analysis are suggested with reference to the Santa Maria Project. Changes in the general criterion, the scope of the analysis, treating projects as lumps or small increments, time streams, exhibition of factors of uncertainty and ranges, estimation procedures, distribution of wealth, and criterion for ranking projects is discussed. In order to illustrate the use of systems-analysis exhibits, McKean compares the Santa Maria Project with the Green River Program, analyzed in Chapter Eleven. If estimates were taken at face value, the Green River Project would require a smaller social investment and yield larger present worths. Moreover, its redistribution of wealth is preferable. However, the variability of the outcome is greater for the Green River Project. (Gossen-Chicago)

W69-06300

AN EXPLORATION OF COMPONENTS AFFECTING AND LIMITING POLICY MAKING OPTIONS IN LOCAL WATER AGENCIES, Colorado State Univ., Fort Collins. Dept. of Political Science.

Duane Hill, Charles Garrison, and Phillip O. Foss. Colorado State Univ. Compl. Rpt Phase I, Nov 1968. 162 p, 22 ref. OWRR Project B-006-COLO.

Descriptors: *Water policy, *Administration, *Administrative agencies, *Decision making, Rural areas, Cities, Communication, Community development, Taxes, Social needs, Political aspects, Local governments, Behavior, Financing, Long-term planning.

Identifiers: *Public systems, Ideology, Negative perceptions, Peer communication, Socialization agents.

This research touches on the major question of how do internal elements in and output from public systems affect, restrict, and/or facilitate water pol-

icymaking and administrative systems. Random samples in five communities, including rural and metropolitan localities, provided a number of major elements in public systems that restrict options of the water policymaker and administrator.

(1) Negative perceptions of the water policymakers; (2) peer communication networks; (3) socialization agents which structure restrict orientations toward taxes and funding; (4) management-constituent communication networks; (5) conflicting ideological formations; (6) low levels of social and political skills among the public. These in-system elements manifest themselves to restrict the policymaker in his options. (1) Persons participating in community decisional affairs tend to have restrictive orientations toward funding water programs; (2) Major contributors to the management communications systems are medium to high social status, political activists with negative perceptions of water officials; (3) persons supporting local water administrators do not have the predispositions or social skills required for effective participation; (4) long-range planning goals gain wide acceptance while public willingness to support budgeting and administrative measures necessary for their attainment is narrowly based; (5) traditional identifications and values restrict local systems' ability to meet the needs of their urbanizing environment. (Heckerling-Fla)

W69-06306

IMPROVEMENT AND MODERNIZATION OF N. Y. WATER LAW WITHIN THE FRAMEWORK OF THE RIPARIAN SYSTEM, Cornell Univ., Ithaca, N. Y.

For primary bibliographic entry see Field 06E. W69-06341

DELAWARE RIVER BASIN.

For primary bibliographic entry see Field 06E. W69-06347

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION).

Commission on Marine Science, Engineering and Resources, Washington, D. C.

Our Nation and The Sea (A Plan For National Action), A report Of The Comm'n On Marine Science, Engineering and Resources, pp 121-166; pp 227-249, Jan 1969. 69 p, 4 tab, 12 fig.

Descriptors: *United States, *Mineralogy, *Oil industry, *International waters, International law, Treaties, Foreign waters, Continental shelf, Marine geology, Federal government, Submerged lands act, Legislation, Leases, Rent, Geological surveys, Waste treatment, Desalination, Potable water, Water sources, Groundwater movement, United Nations, Legal aspects, Administrative agencies, Publications.

The Commission on Marine Science, Engineering and Resources urges the federal government to enunciate and establish national policies and objectives concerning United States interests in the development of nonliving marine resources. The Commission foresees a need for various national projects to be undertaken by the government in order to defray the tremendous expense involved in recovery of such resources. Specifically, the Commission calls upon the government to prepare an extensive geological reconnaissance survey of the continental shelf in order to facilitate industrial exploitation. The Commission proposes that appropriate mechanisms be established to insure exchange of technological information between the federal government, industry, and the scientific community. The federal government's practices concerning leasing schedules of offshore areas are criticized as hampering long range planning by private industry. It is recommended that the government revise the accounting system applied to the pipeline industry in order to promote research. A comprehensive international program for exploration and exploitation of mineral

resources underlying deep seas is proposed by the Commission. (Katz-Fla)
W69-06411

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: DEVELOPMENT OF NONLIVING MARINE RESOURCES.
Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report of the Comm'n On Marine Science, Engineering and Resources, pp 121-127, Jan 1969. 7 p.

Descriptors: *Investment, *Oil industry, *Research and development, *Mineralogy, International waters, International law, Treaties, Foreign waters, Continental shelf, Marine geology, Federal government, Submerged lands act, Legislation, Leases, Rent, Geological surveys, Waste treatment, Desalination, Potable water, Water sources, Groundwater movement, United States, Administrative agencies, Economic efficiency.

The present world petroleum demand will triple within twenty years. Present capital investment in the domestic offshore oil industry is now over one billion dollars and increases by nearly 18 percent annually. It is estimated that within ten years the offshore oil industry will supply 33 percent of world oil production. The Commission notes that present recovery of offshore oil is necessarily more expensive than land recovery operations; however, forecasted technological innovations will greatly reduce production costs. The Commission urges the federal government to reduce the uncertainty surrounding current leasing practices in offshore areas in order to aid in long range planning by private industry. A thorough new assessment of the adequacy of the nations offshore and land oil reserves is urged as a basis for establishment of a national leasing policy, pacing development at a rate consonant with national interest. (Katz-Fla)
W69-06412

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: NATURAL GAS.

Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report of the Comm'n on Marine Science, Engineering And Resources, pp 127-130, Jan 1969. 4 p.

Descriptors: *Natural gas, *Oil industry, *Investment, *United States, International waters, International law, Treaties, Foreign waters, Continental shelf, Marine geology, Federal government, Submerged lands act, Legislation, Leases, Rent, Geological surveys, Waste treatment, Desalination, Potable water, Water resources, United Nations, Legal aspects, Administrative agencies.

The process of bringing natural gas to the consumer involves three sequential functions: production, transmission, and distribution. The petroleum industry explores for and produces the gas while delivery to the consumer is usually undertaken by independent companies. In 1967, natural gas interests paid nearly 300 million dollars to petroleum companies for natural gas produced offshore. The Commission notes that the maximum rates that producers and wholesale distributors of natural gas may charge are subject to Federal Power Commission (FPC) regulation. The Commission recommends that the FPC modify its regulatory policy in regard to pipeline construction and well head prices in order to encourage additional exploration and development of gas reserves, specifically, the Commission recommends that the FPC reexamine its differential price policies for natural gas in order to reflect more accurately the increased cost of offshore production. In order to encourage innovative research within the gas transmission industry, it is recommended that the FPC review its accounting regulations to determine whether such regulations

afford clear and realistic guidelines to the industry. (Katz-Fla)
W69-06413

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION), PART III: OTHER MARINE MINERALS.
Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report Of The Comm'n On Marine Science, Engineering And Resources, pp 130-135, Jan 1969. 6 p.

Descriptors: *Mineralogy, *Investment, *United States, *Continental shelf, International waters, International law, Foreign waters, Marine geology, Federal government, Geological surveys, Research and development, Oceans, Stratification, Legal aspects, Costs, Planning, Economic feasibility, Technical feasibility, Productivity, Financing.

Ocean minerals have been acclaimed as an inexhaustible treasure trove, yet the inaccessibility of most marine minerals and the expense involved in their recovery have deterred exploitation of these resources. The Commission states that an urgent necessity to develop these minerals does not presently exist. However, an early start in the development of required technology is warranted to provide for future contingencies. Research and exploration in this field will be costly, and the government is expected to play a major role. Deposits of various undersea minerals are found in sea water itself, submerged placer deposits, subbottom or substrata of continental shelf and in various nodules, crusts and oozes along the ocean floor. The total 1967 value of world offshore mineral production was nearly 1 billion dollars of which about 20 percent came from United States waters. The Commission notes that the entire amount of such extraction was accomplished nearshore and admonishes that deepwater mining techniques are presently nonexistent despite the tremendous potential returns if such techniques are developed. (Katz-Fla)
W69-06414

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: LEGAL AND REGULATORY CONSIDERATIONS.

Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report Of The Comm'n On Marine Science, Engineering and Resources, pp 135-137, Jan 1969. 3 p.

Descriptors: *Investment, *United States, *Surface investigations, *Research and development, Submerged lands act, Continental shelf, Oceans, International law, Federal government, Administrative agencies, Exploration, Exploitation, Legislation, Legal aspects, Leases.

The Commission noted that, under the Outer Continental Shelf Act, a firm which discovers commercially exploitable undersea deposits does not automatically acquire the privilege to develop these deposits. Under the Act, the government requires that development privileges be acquired by competitive bidding, the discoveror bidding as a newcomer. The Commission regards this practice as particularly onerous in that it deters private industry from expending the required sums for such undersea exploration and development. The Commission favors retention of the competitive bidding system for areas of possible development discovered by government endeavor. The Department of the Interior is responsible for fostering the nations development and utilization of minerals, including undersea minerals. The Commission noted that the Department's Geological Survey and Bureau of Mines expends only seven million dollars annually on discovering and recovering marine minerals. The Commission recommends increased expenditure in this area. (Katz-Fla)
W69-06415

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION), PART III: FRESH WATER RESOURCES.
Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report Of The Comm'n On Marine Science, Engineering and Resources, pp 137-139, Jan 1969. 3 p.

Descriptors: *Desalination, *Potable water, *Surface waters, *Water sources, Foreign countries, Public benefits, Mineralogy, Groundwater movement, Waste treatment, Hydraulic structures, Conveyance structures, Investment, Runoff, Subsurface waters, Legal aspects, Arid lands, Southwest United States.

The Commission views the need for development of fresh water resources as critical to the developing countries. The United States interest in these countries makes water technology, including desalination, a matter of legitimate national concern. While desalination of any type is a much more expensive process than reservoir maintenance, it is essential in areas which cannot provide sufficient surface and ground waters to support additional inhabitants. The capital investment in desalination plants is far less than that required by interregional water transfer projects. The Commission recommends that more research should be directed toward extraction of chemicals from the concentrated brine created in desalination processes. It is strongly urged that research be directed toward the potential fresh water supply in strata underlying the coastal waters. Utilization of such subsurface waters could provide low cost water to arid regions. (Katz-Fla)
W69-06416

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION), PART III: AN INTERNATIONAL LEGAL-POLITICAL FRAMEWORK FOR EXPLORING AND EXPLOITING THE MINERAL RESOURCES UNDERLYING THE HIGH SEAS.

Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report Of The Comm'n On Marine Science, Engineering and Resources, pp 141-147, Jan 1969. 7 p.

Descriptors: *United States, *International law, *International waters, *Treaties, Foreign waters, Legislation, Continental shelf, Marine geology, Leases, Rents, Geological surveys, Administrative agencies, Mineralogy, Oil industry, Exploration, Exploitation, Water resources development.

The Commission recognizes a need to develop an international legal-political framework for exploring the mineral resources beneath the highseas. Such a framework must provide the required incentive for technological development and must insure that all nations will be given a fair chance to engage in undersea mineral exploration and recovery. The Commission views the existing framework under the International Convention on the Continental Shelf as totally inadequate in its uncertainty concerning rights relating to undersea minerals. Private enterprise will be deterred from developing these resources until assured of exclusive access to discovered deposits for a length of time sufficient to realize a profit. Under the Convention, the legal definition of continental shelf is not consistent with geological reality, and the only certainty provided by that Convention is that each coastal state has exclusive shelf mineral rights up to the 200 meter isobath. The Commission recommends that the United States take the initiative and call a convention to affix the continental shelf line at the 200 meter isobath or at a point 50 nautical miles from the baseline used in measuring the territorial sea; whichever line provides the most shelf area should be used in each case. (Katz-Fla)
W69-06417

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Group 6B—Evaluation Process

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION), PART III: AN INTERNATIONAL AUTHORITY TO REGISTER NATIONAL CLAIMS BEYOND THE REDEFINED CONTINENTAL SHELF.

Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report Of The Comm'n On Marine Science, Engineering and Resources, pp 147-156. 10 p.

Descriptors: *Administrative agencies, *International law, *International waters, *Treaties, United States, Foreign countries, Foreign waters, Remedies, Rent, Leases, Exploitation, Development and research, Geological surveys, Mineralogy, Oil industry, Exploration, Continental shelf, Legislation, Legal aspects.

In furtherance of the establishment of a new legal-political international framework, the Commission recommends the negotiation of new international agreements establishing: (1) an International Claims Registry Authority; (2) an international fund and; (3) an intermediate zone. The Registry Authority would be required to register all mineral claims on a 'first come, first registered' basis, requiring only a showing of competency to engage in the undertaking by the registrant. Every nation registering a claim to exploit would be required to pay a portion of the production value into an international fund for distribution and financing of food from the sea programs and related activities. This is a means of providing economic rent to provide for the common welfare of all nations. The International Registry Authority should initially settle any disputes arising under the framework, however, the Authority's decisions should be subject to review by an Arbitration Board. The creation of an intermediate zone is designed to relieve the present uncertainty concerning disputed boundaries of the continental shelves. This zone would be exclusively reserved to the coastal nations or its licensees. (Katz-Fla)

W69-06418

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION), PART IV: GOVERNMENT-INDUSTRY RELATIONSHIPS IN SUPPORT OF RESEARCH DEVELOPMENT.

Commission on Marine Science, Engineering and Resources, Washington, D. C.

Report of The Comm'n On Marine Science, Engineering and Resources, pp 157-166, Jan 1969. 10 p, 2 tab.

Descriptors: *Federal government, *Water resources, *Water resources development, *Industries, Commercial fishing, Mineral industry, Oil industry, Industrial production, Scientific personnel, Costs, Administration, Manpower, Marketing, Oceanography, Continental shelf, Sea water, Engineering, Research facilities, Technology planning, Resource development, Administrative agencies, Financing.

The Federal Government plays an important role in the development of private marine industry. This role should be one of providing incentive and encouragement for greater industrial involvement in the development of marine resources. Since private capital is and will be adequate to finance ocean development, the Commission on Marine Sciences, Engineering and Resources recommends not government subsidies of marine industry but that governmental research and services be made available to encourage investments. The commission recommends that a predictable legal and regulatory environment be established and maintained in order to increase involvement in marine industries. Providing technology and services such as power supply systems for undersea operations and continental shelf studies is a recommended means of governmental involvement to encourage private industry. Interchange of technological and scientific information between governments and the various marine industries is essential to the success

of marine programs. Collaboration by federal, and state governments and industry in planning marine programs will help minimize conflicts among potentially incompatible coastal zone uses. Expenditures necessary to implement the commission's recommendations are stated and discussed. (Helwig-Fla)

W69-06419

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION): ORGANIZING A NATIONAL OCEAN EFFORT.

Commission on Marine Science, Engineering and Resources, Washington, D. C.

Our Nation and The Sea (A Plan For National Action), A Report of the Comm'n on Marine Science, Engineering and Resources, pp 227-249, Jan 1969. 23 p, 3 fig.

Descriptors: *Oceanography, *Oceans, *Federal government, *Administrative agencies, Jurisdiction, Legislation, Law of the sea, Resources, Water resources, Federal budget, Political aspects, United States, Weather forecasting, Weather data, Projects, Research equipment, Environment, Water law, Marine geology, Scientific personnel, Atmosphere, Engineering.

Identifiers: U S Navy, National Science Foundation, U S Coast Guard.

In order to effectively carry out the nation ocean program of the Commission on Marine Science, Engineering, and Resources, there must be a planned and manageable governmental organization. The Commission recommends the creation of an independent federal agency for the administration of the civil marine and atmospheric programs. This agency might be called the National Oceanic and Atmospheric Agency (NOAA). The function of NOAA would be to insure wise use of the marine environment. It should be independent and report directly to the President. In order to insure maximum effectiveness and efficiency, certain existing agencies should be consolidated under NOAA control, and certain functions of other agencies should be transferred to NOAA. Initially, the functions, programs, and equipment of the Environmental Science Services Administration, the U S Coast Guard, and the Bureau of Commercial Fisheries should be consolidated and placed under NOAA control. A National Advisory Committee for the Oceans, with members selected from outside the government, should be established to advise NOAA. This committee would report directly to the president. Until NOAA could be established, marine activities should remain under the direction of the existing agencies. It is recommended that Congressional committee jurisdiction of marine activities be reviewed in light of the recommended executive agency reorganization. (Helwig-Fla)

W69-06420

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

NIAGARA MOHAWK POWER CORP V FEDERAL POWER COMM'N (USUFRUCTUARY RIGHTS AND THE FEDERAL WATER POWER ACT OF 1920).

202 F 2d 190-211 (D C Cir 1952).

Descriptors: *Usufructuary right, *Diversion, *Hydroelectric plants, *New York, Power operation and maintenance, Hydroelectric project licensing, Permits, Federal Power Act, Navigable waters, Riparian rights, Federal government, State governments, Judicial decisions, Legal aspects, Administrative agencies, Regulation, Leases, Financing, Costs, Financial analysis.

Identifiers: *Niagara River, Operating expenses.

Petitioner power company was licensed under the Federal Water Power Act of 1920. This act provides that accumulated earnings in excess of the

reasonable rate of return shall be subject to an amortization reserve, the use of which is controlled by the Federal Power Commission. The company's license under the Act provided for one-half the surplus earnings to go to the reserve. In determining its surplus, the power company excluded as operating expenses \$798,000 in rents paid to two riparian owners for usufructuary rights on the Niagara River. The commission disallowed the expenses. The court of appeals reversed, holding that riparian owners have usufructuary rights in navigable waters, subject to paramount rights of federal and state governments. Neither New York acts, a British-American Treaty, nor the Federal Water Power Act had foreclosed these rights in the riparians, but had merely regulated them. The court held such rights were transferable apart from the land as long as they existed. Thus, the expenditure for the rights was a necessary and valid operating expense and was not subject to the amortization reserve. (Harris-Fla)

W69-06405

6D. Water Demand

CONSUMPTIVE IRRIGATION REQUIREMENTS OF SELECTED IRRIGATED AREAS IN NEW MEXICO,

New Mexico Univ., Las Cruces.

For primary bibliographic entry see Field 03F.

W69-06013

EFFECTS OF SMALL STRUCTURES ON WATER YIELD IN TEXAS,

Geological Survey, Austin, Tex.; and Texas Univ., Austin. Dept. of Civil Engineering.

For primary bibliographic entry see Field 03B.

W69-06218

ECONOMIC EVALUATION OF WATER-PART IV: AN INPUT-OUTPUT AND LINEAR PROGRAMMING ANALYSIS OF CALIFORNIA WATER REQUIREMENTS,

California Univ., Berkeley. Sanitary Engineering Research Lab.; and Calif. Univ., Berkeley. School of Public Health.

For primary bibliographic entry see Field 06B.

W69-06220

6E. Water Law and Institutions

GEORGIA WATER LAW,

Georgia Univ., Athens. Inst. of Government.

Robert C. Kates.

Institute of Government, University of Georgia, Athens, 1969, 395 p, 1910 ref, 11 append. OWRR Project B-013-GA.

Descriptors: *Georgia, *Riparian rights, *Water law, *Water rights, *Legislation, *Riparian waters, Natural flow doctrine, Ownership of beds, Prescriptive rights, Prior appropriation, Riparian land, Water transfer, Water courses (Legal), Wells, Surface waters, Groundwater, Navigable waters, Flood water, Administration, State jurisdiction, Tidal waters.

An objective of the monograph is to set forth in systematic and comprehensive form the present water law of Georgia. The statutes and constitutional provisions, together with interpretative law, are analyzed to determine gaps, inconsistencies and overlaps. Numerous recommendations for remedial legislation are made. Emphasis is on the private right of the use of water as it appears in various stages of the hydrological cycle. The legal rights and liabilities pertaining to the various categories of water are discussed briefly in chapter I. Subsequent chapters consider in detail each category. The Georgia Riparian doctrine—its rights and liabilities as well as its history—is developed in depth in chapters II and III. Chapter IV is concerned with water pollution in non-navigable surface streams and chapter V with navigable and tidal waters.

Chapter VI is concerned with lakes and ponds and chapter VII deals with diffused surface waters. Underground waters are discussed in chapter VIII. Procedures and remedies are discussed in chapter IX and chapter X is concerned with administrative structures. (Conway-Ga Tech)
W69-06009

GOALS AND PERSPECTIVES IN WATER RESOURCES PLANNING.
Office of Science and Technology, Washington, D. C.; and Cornell Univ., Ithaca, N. Y. Water Resources Center.
For primary bibliographic entry see Field 06B.
W69-06046

WATER RESOURCES PLANNING.
For primary bibliographic entry see Field 06B.
W69-06049

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT, CH. 2, THE SETTING.

National Academy of Sciences—National Research Council, Washington, D. C. Committee on Water.
For primary bibliographic entry see Field 06B.
W69-06087

WATER QUALITY CONTROL - THE ROLE OF THE INTERSTATE AGENCY.
Water Pollution Control Federation, Washington, D. C.
For primary bibliographic entry see Field 05G.
W69-06094

WATER QUALITY STANDARDS: THE FEDERAL PERSPECTIVE - PROGRESS TOWARD OBJECTIVES,
Water Pollution Control Federation, Washington, D. C.
For primary bibliographic entry see Field 05G.
W69-06095

FITTING A STATE PROGRAM TO FEDERAL OBJECTIVES,
Water Pollution Control Federation, Washington, D. C.
For primary bibliographic entry see Field 05G.
W69-06096

A FLOOD LOSS REDUCTION PROGRAM,
For primary bibliographic entry see Field 06F.
W69-06097

METROPOLITAN PROBLEMS: METROPOLITAN PUBLIC AUTHORITIES,
Drew Univ., Inst. for Research on Government.
For primary bibliographic entry see Field 06B.
W69-06098

METROPOLITAN PROBLEMS: THE DELAWARE RIVER BASIN COMMISSION,
Delaware River Basin Commission, Trenton, N. J.
For primary bibliographic entry see Field 06B.
W69-06099

UNITED STATES POLICY REGARDING MARINE RESOURCES (IMPLEMENTATION OF THE NEW MARINE POLICY),
Edward Wenk, Jr.
Nat Resources Lawyer, Vol 1, No 2, pp 3-13, June 1968. 11 p.

Descriptors: *Legislation, *Federal government, *Oceanography, *International law, Water utilization, Administration, Foreign waters, Water law, Legal aspects, Technology, Social needs, Federal jurisdiction, Local governments, Political aspects,

Public rights, State governments, Conservation, International waters.
Identifiers: *Marine resources, *Marine science, Executive policy.

There has been a notable shift in national marine policy. Formerly the primary emphasis had been on militarism and trade; the present policy emphasizes exploitation of marine resources for the benefit of mankind. This policy shift is evidenced by the Marine Resources and Engineering Development Act of 1966. To implement the new policy, the act provides for the Marine Science Council and Commission. This agency is to assist and advise the President. Priority programs in marine science application are to be controlled by law. The authors point out that law should be employed as a creative instrument and utilized to foster the social and economic gains sought to be achieved. Programs should be implemented which distribute the risks and benefits of oceanic exploration between the several nations. For purposes of discussion, the legal issues involved in oceanic enterprise were divided into the areas of public law, international law and law on the state and local level. Studies are being conducted by the legal profession in the areas of international, state, and local law. The purpose of these studies is to provide a basis for policy decisions and to encourage the evaluation of a legal code which will best serve our national interests. (Holt-Fla)
W69-06100

A CASE FOR THE ADMINISTRATION OF MARINE RESOURCES UNDERLYING THE HIGH SEAS BY THE UNITED NATIONS,
American Bar Association, Chicago, Ill. Section of Natural Resources Law.

Clark M. Eichelberger.
Nat Resources Lawyer, Vol 1, No 2, pp 85-94, June 1968. 10 p.

Descriptors: *Administration, *Oceans, *International law, *Exploitation, Future planning (Projected), United Nations, Governments, Water law, Legal aspects, Jurisdiction, Taxes, Financing, Resource development, Resource allocation.

There is a pressing need for international control of the exploitation of marine resources. Such exploitation must be regulated in such a way as to: (1) avoid a power struggle; (2) provide equitable distribution of resources to all mankind; (3) provide for peace; and (4) assure enterprising individuals and nations that their investments will be protected. The General Assembly's approach to non-national appropriation of outer space is alluded to as constituting valuable precedent for establishing the above control. It is suggested that an international authority could regulate marine exploration and exploitation and collect royalties which would be used to help the have-not nations develop a richer economic and social life for their people. It is proposed that the United Nations create the administrative machinery and acquire the requisite expertise to establish rules governing sea exploitation. The United Nations, has selected an ad hoc committee to study problems of sea exploitation control. A report by this committee was to be presented at the twenty-third session. The author expresses regret that the action taken lacked the comprehensiveness and force of the General Assembly's approach to appropriation of outer space. (Holt-Fla)
W69-06103

A CASE FOR THE ADMINISTRATION OF MINERAL RESOURCES UNDERLYING THE HIGH SEAS BY NATIONAL INTERESTS,
Northcut Ely.

Nat Resources Lawyer, Vol 1, No 2, pp 78-84, June 1968. 7 p.

Descriptors: *International law, *Oceans, *Regime, *Mining, Exploitation, United Nations, Oceanography, Continental shelf, Resource development, Resources, Beds, Beds under water, Water law, Legal aspects, Permits.

A pressing international problem is how to effectively regulate the mining of undersea minerals. Any regulatory body charged with administering this area of international law would necessarily be empowered to grant exclusive mineral rights to the developer of the field and to provide the developer with protection against claim jumpers. For this service, the regulatory body could expect to enact taxes. Proposed to govern mineral exploitation were the flag nation and the supranational agency regimes. The former regime would recognize the right of the discovering nation to appropriate submerged lands much like the regalian system operates as to exposed lands, and the latter regime would vest exclusive jurisdiction over the sea-bed in some agency like the United Nations. The author evaluates the two proposed regimes and concludes that the flag nation system is definitely the more practical. (Holt-Fla)
W69-06104

ALTERNATIVE REGIMES FOR MARINE RESOURCES UNDERLYING THE SEA,

Francis T. Christy, Jr.
Nat Resources Lawyer, Vol 1, No 2, pp 63-77, June 1968. 15 p, 12 ref.

Descriptors: *International law, *Exploitation, *Oceanography, *Law of the sea, Legal aspects, Technology, Manganese, Beds, Economic impact, Economic justification, Administration, Continental shelf, United States, Jurisdiction.

Alternative solutions to the problems raised by future exploitation of marine resources were discussed. The law, as it exists today, is inadequate to cope with the problems currently plaguing the international community. The authors conclude that in order for a regime to be effective, it must be viable over the long-run and encourage the efficient, peaceful, and orderly exploitation of the mineral deposits in the ocean floor. Four alternative courses of action were discussed. The first was to 'wait and see' what problems emerged from continued development under the present provisions. This was deemed the least palatable solution. Next discussed was the 'national lake approach.' This provides for a proportionate division of the sea among the coastal-states. There was superficial appeal here, but the author discarded this approach as unlikely to solve the problem. The 'flag nation' approach, which in effect allocates rights on a first-come, first-serve basis, was deemed to be remotely feasible. The international regime, which would permit exploitation under the jurisdiction and protection of an international authority, was highly favored. (Holt-Fla)
W69-06105

A NEGATIVE VIEW OF A PROPOSAL FOR UNITED NATIONS OWNERSHIP OF OCEAN MINERAL RESOURCES,

William T. Burke.
Nat Resources Lawyer, Vol 1, No 2, pp 42-62, June 1968. 21 p, 30 ref.

Descriptors: *International law, *Oceanography, *Exploitation, *United Nations, Legal aspects, Resources, Political aspects, United States, Water law, Economic impact, Economic justification, Income, Beds, Mining, Technology, Publications.

Two important issues must be dealt with in the near future. These are: (1) whether the United Nations should be given jurisdiction over deep ocean resources; and (2) what should be considered in developing legal policies regarding exploitation of marine resources. The Soviet Union had proposed an immediate study for recommendations on legal policy for marine exploitation to be presented for adoption by the United Nations. The United States felt that the immediate action proposed was not warranted under existing circumstances. Seven factors to be considered before approving a central jurisdictional control plan over marine resources were listed and discussed. It was indicated that conflicting interests of nation-state and private enterprise should be considered when formulating the

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legal policy governing sea exploitation. It was hypothesized that government-to-government communications and negotiations are more likely to determine the use of the sea. The birth of new nation states would have a marked effect on any legal scheme which was established. Possible methods of dealing with this phenomenon were discussed. Wealth, power, and strategic location were listed as the chief objectives of marine exploitation. The feasibility of adopting a unified approach to international legal problems was explained, and the values, strategies, and conditions which would effect the development of such a unified legal policy were enumerated. (Holt-Fla) W69-06106

THE ROLE OF THE UNITED STATES NAVY IN THE FORMULATION OF FEDERAL POLICY REGARDING THE SEA.

Wilfred A. Hearn.

Nat Resources Lawyer, Vol 1, No 2, pp 23-31, June 1968. 9 p.

Descriptors: *International law, *Continental shelf, *Oceanography, *Law of the Sea, Legal aspects, Water law, Control, Oceans, Beds under water, Navigation, Technology, Projects, Exploitation, Water resources, Exploration.

Identifiers: *United States Navy, North Sea, Marine resources.

The United States Navy is keenly interested in the formulation of federal policy regarding the sea since such policy has a direct bearing on the Navy's role in national defense. In regard to exploiting and exploring for the natural resources in and under the sea, the Navy prefers retention of the 'freedom of the seas' doctrine rather than the extension of the jurisdiction of coastal states over contiguous portions of the continental shelf. The Navy recognizes that disputes between the nations will arise over exploitation of the sea. An area in which a reconciliation of conflicting interests will soon be worked out is in the North Sea. The process of reconciling these conflicting interests will provide the first thorough test of the adequacy and acceptability of the continental shelf doctrine and should add greatly to the precedents available in this developing area of the law. (Holt-Fla)

W69-06107

THE ROLE OF THE STATE DEPARTMENT IN FORMULATING FEDERAL POLICY REGARDING MARINE RESOURCES.

Murray J. Belman.

Natural Resources Lawyer, Vol 1, No 2, pp 14-22, June 1968. 9 p, 5 ref.

Descriptors: *Oceanography, *International law, *Continental shelf, *Administrative agencies, Federal government, United Nations, International waters, Water law, Legal aspects, Political aspects, Treaties, Economic impact, Economics, Exploration, Exploitation, Conservation, Foreign waters. Identifiers: *State department, *Marine resources.

Prior to 1966, the State Department was unconcerned with international policy in the area of deep sea exploration and exploitation, but, since then, they have begun developing foreign policy with respect to marine science activities. It appears that under the continental shelf doctrine the coastal states have sovereign rights to exploit and explore the contiguous portions of the continental shelf. The shelf includes the seabed adjacent to the coast up to a depth of 200 meters or to the limits of exploitability. Such a description is ambiguous and may lead to attempts by various nations to colonize the deep sea and ocean bottom. It is apparent that there is a need for international cooperation to formulate laws governing the exploitation of the sea. Alternative propositions governing ownership of marine resources beyond the continental shelf are that: they belong to nobody; they belong to everybody. Arguments favoring each proposition were discussed. In conclusion, it was stated that international agreements in marine exploitation were

necessary to protect both the have and have-not nations. (Holt-Fla)

W69-06108

SANITARY WATER BOARD V ANTHONY (LEGISLATION TO PREVENT MINE ACID POLLUTION).

For primary bibliographic entry see Field 05G. W69-06109

TUTEN V SHELL OIL CO (SALT WATER DAMAGE TO LAND AND CROPS BY OIL INDUSTRY NEGLIGENCE).

For primary bibliographic entry see Field 05C. W69-06110

MCKINNEY V DENEEN (LIABILITY FOR DISCHARGE OF MINE WASTES).

For primary bibliographic entry see Field 05C. W69-06111

MADDOX V INTERNATIONAL PAPER COMPANY (DAMAGES RESULTING FROM BAYOU POLLUTION).

For primary bibliographic entry see Field 05G. W69-06112

PUNXSUTAWNEY WATER SERVICE CO V SARICKS (CONTAMINATION FROM STRIP MINING).

For primary bibliographic entry see Field 05G. W69-06113

JONES V BREYER ICE CREAM CO (PREScriptive RIGHTS TO POLLUTE STREAM WATERS).

For primary bibliographic entry see Field 05G. W69-06114

B AND B OIL CO V TOWNSEND (OIL WASTE POLLUTION).

For primary bibliographic entry see Field 05G. W69-06115

SMITH V MAGNET COVE BARIUM CORP (BARIUM TAILING POLLUTION).

For primary bibliographic entry see Field 05G. W69-06116

PHILLIPS V SUN OIL CO (GASOLINE POLLUTION OF WATER WELL).

For primary bibliographic entry see Field 05G. W69-06117

PHOENIX V GRAHAM (SALT WATER POLLUTION OF WELLS).

For primary bibliographic entry see Field 05G. W69-06118

COMMONWEALTH V BLACK (INJUNCTION RESTRAINING STRIP MINING OPERATIONS).

For primary bibliographic entry see Field 05G. W69-06119

MASONITE CORP V WINDHAM (PONDING AND POLLUTION ON UPPER LAND).

For primary bibliographic entry see Field 05G. W69-06120

MILOTTA V PFEIFFER (NATURAL FLOW AND RIGHTS TO SURFACE DRAINAGE).

Westmoreland Law Journal Vol 34, pp 33-36 (C P Pa 1952).

Descriptors: *Pennsylvania, *Surface drainage, *Alteration of flow, *Natural flow doctrine, Ditches, Relative rights, Obstruction to flow, Natural streams, Land tenure, Judicial decisions, Diversion, Legal aspects, Natural flow, Surface waters. Identifiers: *Easements, *Adjacent landowners.

Plaintiffs and defendants own adjacent tracts of land from which surface water has been drained for forty years by a ditch parallel to the boundary line. Defendants closed the ditch and by pipes and smaller ditches concentrated and diverted water onto plaintiffs' land. Plaintiffs alleged damage to their orchards which would continue if defendants were not restrained. After a *situs visit* and testimony, the court of common pleas held that surface waters must be allowed to run their natural course and any obstruction or alteration which is injurious is actionable. An 'accustomed flow' for over 21 years raises a presumption of right in the plaintiff to have the flow in the ditch continue. Channels draining from defendant's land into the ditch have with time acquired the character of easements which plaintiff was entitled to see continued. The court granted a restraining order to prevent diversion and ordered the establishment of the drainage ditch as it existed prior to defendants' alterations. (Harris-Fla)

W69-06121

THE WETLANDS COMMITTEE REPORTS, WETLANDS CLASSIFICATION, INVENTORY AND MANAGEMENT.

Journal of Soil and Water Conservation, Vol 17, no 1, pp 41-42, Jan-Feb 1962. 2 p.

Descriptors: *Wetlands, *Land management, *Land classification, *Soil conservation, Federal governments, State governments, Planning, Water resources development, Water conservation, Census, Administrative agencies, Land use, Land development, Land resources, Natural resources, Marshes, Facilities, Drainage, Wildlife conservation, Publications, Surveys.

In areas where facilities exist for cooperation between agencies, both federal and state, considerable progress has been made in reaching agreements on wetland use. A significant effort has been made through individual agencies to inventory, classify, and manage wetlands. This summary report is the work product of the Wetlands Committee. The report was approved by the Soil Conservation Society of America, and was published in an effort to provide some guidelines and to stimulate cooperation in development of a total wetland use program to serve all public interests. Recommendations are made in the areas of: (a) wetland classification, (b) wetland inventories, and (c) special programs of total wetland use. These recommendations are made with a view toward creating facilities for the development of a wetland classification and management program in which conservation or land-use agencies would cooperate. (Heckerling-Fla)

W69-06122

HEREDA V LOWER BURRELL TP (UNNATURAL WATER AND SEWAGE DISCHARGE).

159 Pa Super 262, 48 A 2d 83-85 (Pa Super Ct 1946).

Descriptors: *Pennsylvania, *Water, *Sewage, *Drainage, Pipes, Tile drains, Channels, Ditches, Judicial decisions, Water law, Legal aspects, Eminent domain, Floodwater, Roads, Discharge (Water), Natural flow, Damages, Conduits.

In 1936 plaintiff acquired property to the west of and lower than a private road. A ditch east of the road drained water and sewage. Such ditch had never caused flooding of plaintiff's property. Defendants made the road a public highway in 1937 and inserted a drainage pipe which connected the east side ditch with an artificial channel on the west side of the road. The channel flowed toward plain-

tiff's property. Subsequently, the east side ditch, which had previously carried street water, was closed, and the water and sewage were diverted through the pipe, into the west side artificial channel, and onto plaintiff's land. Plaintiff brought an action for damages caused by this alleged 'taking' by defendant. The court held for plaintiff, finding that defendant had accumulated the water and sewage and diverted it in bulk into an artificial conduit and channel and then discharged it upon plaintiff's land where it would not otherwise have been discharged. (Holt-Fla)
W69-06123

BOECK V YELLOW MEDICINE COUNTY (DRAINAGE DITCHES).
62 NW 2d 80-85 (Minn 1954).

Descriptors: *Minnesota, *Drainage systems, *Ditches, *Assessments, Judicial decisions, Drainage, Surface drainage, Drainage programs, Local government, Legislation, Laterals, Outlets, Pipes, Streams, Riddance (Legal aspects), Surface runoff, Open channels, Benefits, Legal aspects.
Identifiers: Bull ditches, Sloughs.

Respondent owned land separated from a stream by other riparian land. Water from respondent's land was drained off by means of artificial ditches across the adjacent land and into the natural watercourse. Appellant county proposed to improve an existing drainage ditch and drainage outlet on the natural watercourse. Appellant sought to assess respondent for benefits to her land from the proposed improvement. The supreme court affirmed the trial court, reasoning that in order to assess a person for benefits from a public drainage project, there must be a showing of actual benefit to that person. Whether the land has been benefited is a question of fact. Since respondent's land had previously been adequately drained, the court found the evidence sustained a finding that the land would receive no benefit from the proposed improvements. (Helwig-Fla)
W69-06124

CHAMBERLIN V CIAFFONI (NATURAL FLOW AND SURFACE DRAINAGE IN CITIES).

373 Pa 430, 96 A 2d 140-143 (1953).

Descriptors: *Pennsylvania, *Natural flow doctrine, *Common enemy rule, *Surface drainage, Cities, Drainage systems, Land tenure, Relative rights, Land use, Judicial decisions, Legal aspects, Discharge (Water), Damages, Diversion, Reasonable use, Drainage, Surface runoff, Flow augmentation.

Identifiers: *Regrading, *Damnum absque injuria, *Upper landowners.

Plaintiff and defendant were owners of properties separated by a 10-foot wide alley. Plaintiff alleged that the defendant regraded the surface of his land to cause a diversion of the natural drainage of surface waters, and thereby discharged water onto the alley and into the basement of a building on plaintiff's property. Plaintiff also alleged the deposit of large amounts of earth and fill on the alley. The bill prayed for an injunction and damages. The court of common pleas denied the relief sought. In affirming, the supreme court of Pennsylvania held that even though the improvement of defendant's property caused an increase in natural drainage which plaintiff's disposal facilities could not handle, under the 'common enemy rule' upper landowners may improve his land by regrading without responsibility for consequent diversion of surface waters resulting from his enjoyment of the property. If unavoidable loss is brought on his neighbor, it is damnum absque injuria. The court further held that owners of municipal property own with the condition that municipal improvement may alter the natural surface of the land. (Harris-Fla)
W69-06125

MC KEON V BRAMMER (SUBSURFACE DRAINAGE AND THE NATURAL FLOW DOCTRINE).

29 NW 2d 518-527 (Iowa 1947).

Descriptors: *Iowa, *Subsurface drainage, *Natural flow doctrine, *Easements, Tile drainage, Drains, Watercourses, Artificial watercourses, Natural streams, Drainage systems, Storm drains, Subsurface flow, Subsurface runoff, Drainage districts, Judicial decisions, Legal aspects, Obstruction to flow.
Identifiers: *Lowland proprietor, Upland owners.

Plaintiff brought suit to enjoin the continuance of an obstruction that the defendant, a lowland proprietor, placed in a drainage system which extended from the plaintiff's land across the defendant's land. The defendants challenged the right of the plaintiff to an easement in the drain system. They contended that the creation of a special drainage district had extinguished the easement of the plaintiff. The court ruled that the plaintiff had established a right of easement. In addition, the court found that the water that drained from the plaintiff's upper land did not substantially increase the quantity of water in its natural flow. As a consequence, the defendant was ordered to remove the obstruction. The decision upheld the rule which allows an upper proprietor to drain his land through natural watercourses even if it means increasing the flow over the lowland property; however, it must do so without causing substantial injury. (Stewart-Fla)
W69-06126

POLICH V HERMANN (ABNORMAL DISCHARGE OF SURFACE WATER).

219 SW 2d 849-856 (Mo Ct App 1949).

Descriptors: *Missouri, *Surface water, *Riddance (Legal aspects), *Easements, Judicial decisions, Legal aspects, Remedies, Surface drainage, Roads, Road construction, Obstruction to flow, Natural flow, Outflow, Sewers, Discharge (Water), Slopes, Damages, Repulsion (Legal aspects).

Plaintiff and defendant, adjacent property owners, by agreement created a 15 foot driveway easement between their properties. Each contributed 7 1/2 feet of land to the easement. Prior to the agreement, the 15 foot strip had been level; the agreement provided that each property owner was to surface his side of the driveway creating respective slopes from the centerline to each party's property. Defendant dumped three loads of dirt on his side of the roadway. This dirt caused abnormal amounts of surface water to flow from defendant's side to plaintiff's side of the driveway. The abnormal flow of water carried weeds and dirt into the mouth of a sewer on plaintiff's side of the driveway. Debris finally clogged the sewer completely, causing water to overflow into plaintiff's basement. Plaintiff then sought an injunction to restrain defendant from obstructing the driveway easement. The injunction was granted. The court held that defendant, as upper landowner, had no right to increase the quantity of water discharged upon the lower estate to any greater extent than would have been discharged by the natural course of drainage. (Holt-Fla)
W69-06127

STACY V WALKER (PROTECTION AGAINST SURFACE WATER DRAINAGE).
262 SW 2d 889-891 (Ark 1953).

Descriptors: *Arkansas, *Obstruction to flow, *Surface drainage, *Levees, Natural streams, Drainage ditches, Relative rights, Scour, Natural flow, Judicial decisions, Flooding, Contours, Legal aspects, Rainfall, Rain water, Surface runoff.
Identifiers: *Adjacent landowners.

Plaintiff brought action for damages to his cotton crop and a mandatory injunction directing defendant to breach a levee, which defendant had constructed to repel rain water flowing from plaintiff's land. Plaintiff and defendant owned adjoining farms separated by a fence row. Rain falling on plaintiff's land followed slight surface depressions and accumulated at a point on the boundary where it emptied onto defendant's land. At no point could the drainage contours be called a natural flow way. The surface water drainage caused 'scouring' on both plaintiff's and defendant's land. Reversing a judgment for plaintiff, the supreme court of Arkansas held that where water flows through low places not natural streams, a landowner is under no duty to receive it upon his land, and he may repel the water at his boundary if unnecessary and disproportionate harm to others does not result. Defendant had a right to defend his land. The harm to plaintiff's land from water backed up on his side of the boundary could be alleviated at small expense by the construction of a drainage ditch. Both tracts would then be protected. (Harris-Fla)
W69-06128

UNITED STATES V SHAPIRO, INC. (LIABILITY FOR DIVERSION OF SURFACE DRAINAGE BY GRADING).

101 F Supp 27-29 (D DC 1951).

Descriptors: *District of Columbia, *Surface drainage, *Damages, *Diversion, Surface waters, Surface runoff, Drainage, Groundwater movement, Remedies, Legal aspects, Judicial decisions, Water law, Fences.
Identifiers: Debris.

Plaintiff brought suit for injunctive relief, alleging that defendants, in grading their land, diverted the natural flow of drainage water. The change was such as to cause debris to be carried against a wire mesh fence separating the parties' lands. The court held that the plaintiff had not established a cause of action. The damages claimed to have been sustained were damnum absque injuria. A property owner may not cause water, soil, dirt or debris to be deposited on adjoining land. But it has been established that a landowner who is not guilty of negligence may, in the ordinary use of his property, cause a change in the direction of the drainage without liability to the proprietor of the adjoining property. (Gabrielson-Fla)
W69-06129

DENT V ALEXANDER (ACCELERATED FLOW OF SURFACE DRAINAGE).

235 S W 2d 953-955 (Ark 1951).

Descriptors: *Arkansas, *Surface drainage, *Surface waters, *Repulsion (Legal aspects), Diversion, Overflow, Channel, Surface runoff, Alteration of flow, Flow, Overflow, Groundwater movement, Legal aspects, Judicial decisions, Water law, Remedies, Damages.

Appellants alleged that appellees diverted surface water from their own lands into drainage ditches and caused such water to flow upon the lands of appellants in an unnatural channel and in increased volume. The chancellor found that this surface water drained into a large lake on the appellants' property. He ruled that, even if it were established that the small ditch diverted surface water into the lake, the amount diverted was so minute in comparison with the size of the lake as to make any increase in the level of the lake negligible. The court held that the chancellor's finding that the acceleration of the natural drainage did not warrant the intervention of an equity court was not against the preponderance of the evidence. The common enemy doctrine applies in Arkansas. Thus, a landowner has the right to fend off surface waters as best he can, and he is not liable for damages resulting from such diversion unless he unnecessarily injures another. Here, the testimony showed the ap-

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pellants were neither substantially nor unnecessarily injured by the accelerated flow of surface waters. (Gabrielson-Fla)
W69-06130

SMEDBERG V MOXIE DAM CO. (DAMAGE CAUSED BY LOWERING POND LEVEL).

92 A 2d 606-611 (Me 1952).

Descriptors: *Maine, *Great ponds, *Ownership of beds, *Water level fluctuations, Dams, Public rights, Lumbering, Lumber, Remedies, Ponds, State governments, Relative rights, Legal aspects, Judicial decisions, Damages, Fishkill, Fish.
Identifiers: Standing.

In 1911, defendant was authorized by charter to maintain dams at Lake Moxie for the purpose of accumulating and storing water for log driving purposes. Defendant, the owner of a hotel and sporting camps near the great pond, sought to enjoin the defendant from causing the level of the lake to fluctuate, claiming that such fluctuations depleted the supply of fish in the lake. This fish-kill, in turn, destroyed plaintiff's rental business. From a decree dismissing his bill, plaintiff appealed. The court held that the alleged damage to fishing was not peculiar to plaintiff, and, since plaintiff's right to fish in the lake was no greater than the right of the public generally, the claimed loss was damnum injuria. An individual who chooses to engage in a business based on the use of a resource held in trust by the state does not create for himself a private right which will support his cause of action as an individual. The state is the owner of the great ponds, and only it has standing to maintain action to abate a public nuisance affecting the ponds. (Gabrielson-Fla)

W69-06131

BOHANNON V CAMDEN BEND DRAINAGE DISTRICT (TAKING OF PROPERTY BY WATER DISTRICT).

208 S W 2d 794-802 (Ct App Mo 1948).

Descriptors: *Missouri, *Drainage districts, *Eminent domain, *Condemnation, Reasonable use, Riparian rights, Hydraulic structures, Impounded waters, Detention reservoirs, Easements, Low water mark, Water level fluctuations, Statutes, Lakes, Streams, State governments, Water resources development, Legal aspects, Judicial decisions, Ditches.

Plaintiff brought action against the defendant drainage district, a public corporation, to enjoin defendants from constructing and maintaining a ditch and from lowering the level of a private lake thereby, to the detriment of plaintiff's property bordering the lake. Though contiguous with the district boundaries and subject to a greater volume of overflow than the lands within the district, plaintiff's property was not included as part of the district. Plaintiff contends that in times of drought, the defendants' plan will lower the water level in the lake to such an extent that a swamp will exist in place of the lake. Plaintiff alleged in the alternative that in times of thaw, the ditch would be inadequate and insufficient to remove waters coming into the lake, and that a holding basin would be so created which would flood the plaintiff's land. The court, reversing the lower courts decision dismissing the complaint, held that taking plaintiffs' property for use by the district without payment for damages or without prior condemnation was in contravention of state law and public policy. (Katz-Fla)

W69-06132

VOLLRATH V WABASH RAILROAD CO. (DAMAGE DUE TO FLOOD WATER FLOW THROUGH ARTIFICIAL EMBANKMENT CUT).

For primary bibliographic entry see Field 04C.

W69-06133

KEELER V TUBBS (LIMITATIONS UNDER WATER CONTRACTS).

147 NYS 2d 166-172 (SC 1955).

Descriptors: *New York, *Wells, *Distribution, *Water contracts, Proprietary power, Usufructuary rights, Water rights, Remedies, Legal aspects, Judicial decisions, Water law, Relative rights, Pipes.

In 1934, plaintiffs and defendants entered into a water rights contract with one Peckham, which allowed them to pipe water from a well on Peckham's property. No other persons were to be permitted to connect lines without permission from the parties involved. Subsequently, plaintiff acquired the land upon which the well was situated. Later, both plaintiffs and defendants extended their water lines to other adjacent tracts. Plaintiffs sought an injunction to restrain defendants' from piping water through their extension lines; defendants countered with a similar suit. The court held that when plaintiffs acquired the property and the well, they acquired the right to full enjoyment of the land and its underground waters. Defendant could only complain if his water supply was diminished. The court also found that one of defendant's extensions had been used openly for ten years without objection. This failure to object amounted to tacit consent by plaintiffs. However, defendants' recent extension of the water line to a new tract was immediately objected to by plaintiffs and was a clear violation of the contract. An injunction was granted, but was made applicable to only the latter extension. (Gabrielson-Fla)

W69-06134

DROEGMILLER V OLSON (DIVERSION OF NATURAL FLOW).

40 NW 2d 292-303 (Iowa 1949).

Descriptors: *Iowa, *Natural flow doctrine, *Diversion structures, *Relative rights, Water law, Judicial decisions, Natural flow, Obstruction to flow, Diversion, Routing, Dikes, Ditches, Silts, Administrative agencies, Public rights, Prescriptive rights, Floodgates, Alteration of flow.

Plaintiff diverted water from its natural course to a highway bridge leading to a neighbor's land. The neighbor complained to the defendant county of the increased flow. Defendant then built a dike at the bridge which returned waters via a ditch to their natural course. Plaintiffs sued to compel removal of the dike, silt from highway ditches under bridges, and the installation of floodgates in ditches. Defendant asked that plaintiffs be enjoined from diverting water onto a public highway. The trial court required to remove the silt and to install floodgates. The appellate court held that plaintiff must remove his dike which caused the diversion, and that defendant could not be compelled to provide floodgates since there was no showing that the highway construction caused any injury to plaintiff. The court further ruled that neither the statute of limitations nor prescriptive right can be urged against the public. Defendant was compelled to remove silt obstructing the natural flow at the bridge where defendant's dike was placed, but was not compelled to remove the dike. (Wheeler-Fla)

W69-06135

PROUTY V CITIZENS UTILITIES CO. (SALE OF PROPERTY ALONG NAVIGABLE RIVER).

150 F Supp 892-900 (D Vt 1957).

Descriptors: *Vermont, *Navigable water, *Federal Power Act, *Contracts, Condemnation, Real property, Judicial decisions, Rivers, Legislation, Federal government, Hydroelectric plants, Mill dams, Riparian land, Banks.
Identifiers: Specific performance, Clyde River.

Plaintiffs brought suit for specific performance of a contract providing that lessee (defendant) was to purchase a piece of property if an option to purchase had not already been exercised when the lease terminated. A price was to be agreed upon at that time, and, if no price could be agreed upon,

the lessee was to institute condemnation proceedings within six months. If no such proceedings were instituted, the price was to be \$300,000. The property consisted of land bordering on the Clyde River, a dam, mill, and various water rights. The court held that, merely because the case required an interpretation of the Federal Power Act, the proceedings did not have to be brought by the Federal Power Commission. However, since the Clyde River was navigable, defendant should have been licensed by the Federal Power Commission to carry out its activities. The court held that the Vermont Public Service Commission had no jurisdiction to allow defendant to condemn the property. The court concluded that the contract had been breached and ordered specific performance. (Williams-Fla)

W69-06136

SEWAGE CONNECTION FACILITIES.

Mich Comp Laws Ann secs 123.191-123.195 (1967).

Descriptors: *Michigan, *Legislation, *Sewage treatment, *Sewage disposal, Treatment facilities, Wastes, Water pollution sources, Waste water treatment, Water resources, Treatment, Legal aspects, Sewage.
Identifiers: *Sewage connection facilities.

In counties exceeding 300,000 in population, any property from which sanitary sewage emanates shall be connected to an available public sanitary sewage collection facility. The connection shall be completed within 18 months after the date of the availability of such public facility. When any property has not been connected within 18 months, the owner or operator of the facility shall require the connection to be made by a written demand on the owner of the property. If the property is not connected within 90 days after the date of the mailing of the written demand, the owner or operator of the facility may forthwith enter upon the property and install, construct and make such connections to abate the nuisance. The owner of the property shall be liable for the costs incurred in making the connection. Whenever the owner or operator of any public sanitary collection facility deems it necessary to enter upon any property to ascertain if it is property from which sanitary sewage emanates, and is refused such entry, the owner or operator shall make complaint in writing to any judge. The judge may issue a warrant directed to the sheriff commanding him to take sufficient aid to enter upon the property for the duration required to enforce the provisions of this act. (Dean-Fla)

W69-06137

REGULATION OF USE OF WATER RESOURCES.

NC Gen Stat sec 143-215.11 to 215.37 (1967 Supp).

Descriptors: *North Carolina, *Administrative agencies, *Groundwater, *Surface water, Dams, Regulation, Permits, Real property, Dam construction, Design, Operation and Maintenance, Engineering structures, Legislation.

Identifiers: Capacity use areas, Penalties (Criminal).

The Board of Water Resources is authorized to determine 'capacity use areas.' These are areas where use of groundwater and surface water have developed so as to require regulation or where such uses threaten to exceed renewal or replenishment levels. Procedures are set out for such declarations. The Board may make regulations within these areas. Permits must be acquired from the Board for withdrawals in excess of 100,000 gallons per day within capacity use areas. The right to notice and hearing is provided for. Duration of permits, transferability of permits, reports by permittees, and penalties for violations are provided for. The Board has right of entry upon all lands in performance of

its duties. This statute is not to be construed as modifying the riparian doctrine. Sections 215.23 et seq constitute the Dam Safety Law of 1967. Application must be filed with the Department before any person begins construction of a dam. Certain federal dams are exempt. Application must also be made before commencing any repair, alteration, or removal of a dam. Projects must be supervised by qualified engineers, and these engineers may be required to report to the Department. Upon completion of the project, notice must be given to the Department, accompanied by drawings and descriptive matter. The Board is empowered to supervise maintenance and operation of dams and has the right to inspect the structure at any time. (Williams-Fla) W69-06138

PUBLIC UTILITIES: CARRIERS AND WATER COMPANIES.

Me Rev Stat Ann tit 35, secs 3201-3210, 3241-3252, 3291-3296 (1965); Me Rev Stat Ann tit 35, secs 3241, 3291, 3294 (Supp 1968-69).

Descriptors: *Maine, *Eminent domain, *Public utilities, Legislation, Proprietary power, Aqueducts, Pipes, Administrative agencies, Adjudication procedure, Local governments, Water distribution, Water districts.

Identifiers: *Incorporation, Corporate water company, Contracts, Damages, Injunction, Public utilities commissions.

The first section deals with the incorporation of water companies by proprietors of aqueducts for conveying fresh water into towns. The procedures to be followed in order to incorporate are described. After incorporation the proprietors are to operate in accordance with the corporate charter and by-laws. In addition, the powers and authority of directors and proprietors are enumerated. The statute declares that all contracts made by or with the corporation are in force after its dissolution. Water companies are authorized to exercise the right of eminent domain under the prescribed procedures. The county commissioners are to estimate the amount of the damages to be paid for the condemned land. An appeal of this estimate may be made to the Superior Court. An injunction may be had when damages are not paid within 30 days after they are due. The owner of the property subject to appropriation by eminent domain is allowed to have the necessity of such taking determined by the Public Utilities Commission. (Stewart-Fla) W69-06139

MUNICIPALITIES: PUBLIC WORKS, DEVELOPMENT.

Me Rev Stat Ann tit 30, secs 5103, 5106 (1965), Me Rev Stat Ann tit 30, secs 5103.6, 5106.9 (Supp 1968-69).

Descriptors: *Maine, *Cities, *Utilities, *Expenditures, Public benefits, Legislation, Local governments, Water supply, Sewers, Drains, Bridges, Flood control, Water districts, Public utility districts, Wetlands, Swamps, Marshes, Fish, Recreation, Fish management, Recreation facilities, Conservation, Financing.

A municipality may raise or appropriate money for public buildings, ways, bridges, parks, parking places, sewers, and drains. It may provide for projects which have been approved by the Governor for improving navigation or preventing property damage by erosion or flood. It may also provide financial assistance to a water or sewer district which is a quasi municipal corporation situated entirely within the municipality. A municipality may raise or appropriate money for the following purposes: (1) to purchase real estate and personal property from the Federal Government for municipal purposes; (2) to provide real and personal property for recreational purposes; (3) to propagate and

protect fish in public waters located wholly or partially within its boundaries; and (4) to provide for and acquire open areas, including marshlands, swamps or wet lands, as defined in section 3851. (Heckerling-Fla) W69-06140

REVENUE PRODUCING MUNICIPAL FACILITIES ACT.

Me Rev Stat Ann tit 30, secs 4251-4264 (Supp 1968-69).

Descriptors: *Maine, *Public utilities, *Public benefits, *Water supply, Income, Sewage disposal, Municipalities, Facilities, Treatment facilities, Rates, Use rates, Contracts, Eminent domain, Local governments, Expenditures, Legislation, Water rates.

The Revenue Producing Municipal Facilities Act grants to a municipality the power to acquire, construct, or improve any revenue producing municipal facility consisting of a water system or a sewer system. It may pledge the revenue derived from any water or sewer system to pay for such systems. The municipality may acquire rights in land or water rights in connection with the construction, etc. of the facility. A municipality has the power to enter on any water to make surveys, soundings, etc. Once a sewage disposal system is in operation, each owner or occupant shall connect with it. (Heckerling-Fla) W69-06141

DRAINAGE AND WATERCOURSES.

Me Rev Stat Ann, tit 23, secs 3251 to 3255 (1965).

Descriptors: *Maine, *Highways, *Drainage, *Watercourses (Legal), Legislation, Ditches, Drains, Culverts, Roads, Administrative agencies, Local governments, Damages, Bridges, Bridge construction, Road construction, Cities, Roads, Obstruction of flow, Drainage, Permits, Legal aspects. Identifiers: Penalties (Civil), Public way. W69-06144

The municipal officers of a town may construct ditches, drains and culverts to carry water away from any highway through any lands when they deem it necessary for public convenience or for proper care of the highway. Such ditches, etc., shall be under the control of said officers, and interference therewith is punishable by a fine or imprisonment. The town is liable for damages to the owner of the land if it does not maintain the ditches, etc. No person not having legal supervision of a public way shall cultivate any portion of the wrought part of any public way so as to change or obstruct drainage. With written permission, any person may maintain a bridge across such ditch or drain for egress or regress to and from lands occupied by him. Violation of any provision of this section subjects the violator to a fine. No road commissioner, without written permission from the municipal officers, shall cause a watercourse to be so constructed by the side of a way as to inconvenience or obstruct any house or other building. (Heckerling-Fla) W69-06142

DEPARTMENT OF HEALTH AND WELFARE.

Me Rev Stat Ann, tit 22, secs 1, 3 (1968-69 Supp).

Descriptors: *Maine, *Public health, *Administrative agencies, *Social aspects, Legislation, Water supply, Cities, Water purification, State governments, Water sources, Water quality, Regulation. Identifiers: *Department of Health and Welfare.

The Department of Health and Welfare shall consist of such bureaus and divisions as may be required to carry out the work of the department. The department shall have the general supervision of the interests of health and life of the citizens of the State. The department shall consult with and advise municipalities and persons and corporations

having systems of water supply, as to the most appropriate source of supply and best method of assuring its purity, and shall approve all new water supply sources, purification systems and plants. The Advisory Committee of Health and Welfare shall make investigation of social problems, recommend enactment of laws, advise with reference to the policy of the department, and recommend the issuance of rules and regulations. (Heckerling-Fla) W69-06143

FISHERIES; CONSERVATION.

Me Rev Stat Ann tit 12, secs 3451, 3452, 3703, 3704 (Supp 1968-69), Me Rev Stat Ann tit 12, secs 3452, 3501, 3503, 3602, 3701, 3702 (1965).

Descriptors: *Maine, *Fish conservation, *Commercial shellfish, *Legislation, Research and development, Clams, Oysters, Mussels, Salmon, Land classification, Environment, Epizootiology, Aquatic environment, Legal aspects, Water pollution, Dams.

Section 3452 permits the fisheries department to take shellfish from polluted waters and to experiment in an effort to find a commercially feasible method for purifying them to saleable grade. The Commissioner of Sea and Shore Fisheries may inspect and close any shores or waters which are found to be polluted. This may be done without first conducting a public hearing. Section 3602 empowers the Salmon Commission to purchase or lease any lands, dams, and flowage rights which are needed to promote the conservation of salmon. Sections 3701-3703 permit the commissioner to take any flats or waters needed for research relative to fish, provided the amount of land taken shall not be over 2 acres in any one location and the written permission of adjacent riparian owners is obtained prior to such appropriation. Areas larger than 2 acres may be taken under written lease from the owner. It is unlawful to take any marine species from such research areas. (Blunt-Fla) W69-06144

HATCHERIES, SCREENS AND GAME MANAGEMENT AREAS.

Me Rev Stat Ann tit 12, secs 2151-2153, 2155 (1965); sec 1951 (1968-69 Supp).

Descriptors: *Wildlife management, *Fish management, *Maine, *Legislation, Fisheries, Public benefits, Recreation, Lakes, Ponds, Streams, Marshes, Condemnation, Natural resources, Public lands, Hunting, Boating, Fishing, Camping, Parks, Regulation.

The commissioner for the location, construction, maintenance, and operation of a game management area, fish hatchery, or feeding station may acquire and survey property for such purposes in the name of the state. The United States Fish and Wildlife Service may conduct such fish culture operations and scientific investigations in the waters of the state as it deems necessary. The state may authorize, alter, or remove the screening of any inland waters, and may make provision for passage of logs and pulpwood, may prohibit fishing in the vicinity of the screens, and may punish for injury to screens. The state commissioner may regulate hunting, fishing, trapping, boating, camping, and other public use of game management areas. This authority extends to lakes, ponds, marshes, and sections of streams lying within the area. The Commissioner may sell the natural products of the land for the state. The Commissioner of Inland Fisheries and Game is appointed by the governor and may designate a deputy. The Commissioner serves a term of three years and must make annual reports to the governor. (Kelly-Fla) W69-06145

FORESTS, PARKS, LAKES, AND RIVERS.

Me Rev Stat Ann Tit 12, secs 501, 504, 514 (1968-69 Supp).

Field 06—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

Descriptors: *Maine, *Forest management, *Legislation, *Public lands, Legal aspects, Forestry, Lumber, Ponds, Islands, Submerged lands, Camp sites, Ownership of beds, Dams, Dredging, Waste disposal, Riparian rights, Bridges, Great ponds.

A Forest Commissioner shall be appointed by the governor. He must be trained as a forester or be skilled and experienced in the care and preservation of forest lands. He may not have direct or indirect interest in the purchase of state land when he is appointed or during his term of office. The commissioner has supervisory and administrative control over the public domain including unconveyed islands, unconveyed land beneath great ponds, and other lands the management of which is not provided for by law. The commissioner may sell timber rights, grass rights, and gravel for highways or other public use. He may lease camp sites, mill privileges, dam sites, flowage rights, and certain construction privileges. He may grant mining rights and permits for dredging and waste disposal, provided adequate hearings are given and abutting owners and affected water utilities receive notice. He may further grant permits to riparian owners for construction of causeways, bridges, marinas, or fills, provided the statutory requirements are met. (Kelly-Fla)
W69-06146

PALMER V MASSENGILL (OBSTRUCTION TO FLOW OF ARTIFICIAL WATERCOURSE).

58 So 2d 918-922 (Miss 1952).

Descriptors: *Mississippi, *Surface runoff, *Obstruction to flow, *Artificial watercourses, Damages, Surface waters, Drainage systems, Drainage, Relative rights, Watercourses (Legal), Water law, Judicial decisions, Dams, Alteration of flow, Ditches, Dam construction, Backwater, Channels, Surface drainage, Repulsion (Legal aspects).

Plaintiffs brought action for damages allegedly due to defendants' construction of a dam across their lands which caused flooding of the adjacent lands of plaintiff. The dam was built following plaintiffs' construction of an artificial water channel on their land which increased surface water flow onto defendants' land. The lower court held for the defendant, and this court affirmed. The law regarding natural watercourses was found inapplicable. The court held that defendants' action was reasonable even though a drainage ditch at the base of the dam on defendants' side could have been placed on plaintiffs' side. Had the ditch been so placed, the excess water would have been carried off. (Wheeler-Fla)
W69-06147

HERMANSEN V CITY OF LAKE GENEVA (RIPARIAN RIGHT TO REQUIRE REMOVAL OF PIERS).

272 Wis 293, 75 NW 2d 439-444 (1956).

Descriptors: *Piers, *Wisconsin, *Riparian rights, *Ownership of beds, Riparian waters, Water law, Judicial decisions, Relative rights, Riparian land, Competing uses, River beds, Banks, Legal aspects, Preferences (Water rights), Docks.
Identifiers: Injunctions (Mandatory).

Plaintiffs brought action against defendant municipal corporation, alleging that maintenance of piers and boat slips on the edge of property claimed by plaintiffs constituted an invasion of riparian rights. Plaintiffs asked that defendant be permanently enjoined from further interference with plaintiff's lawful activities. The court held for the plaintiff, emphasizing the fact that plaintiffs had title to the shore property while the state owned the river bed. Riparian rights rest on title to the shore, not upon title to the underwater soil. Clearly the state did not possess the rights of a riparian owner. This being so, the continued maintenance of the piers and boat slips constituted an invasion of plaintiff's riparian rights. The permanent injunction was properly entered. (Wheeler-Fla)
W69-06148

SAELENS V POLLENTIER (SUIT TO ENJOIN DEFENDANT'S INTERFERENCE WITH THE FLOW OF SURFACE WATERS).

7 Ill 2d 556, 131 NE 2d 479-483 (1956).

Descriptors: *Illinois, *Prescriptive rights, *Surface drainage, *Ditches, Surface waters, Drainage, Easements, Watercourses (Legal), Channels, Natural streams, Water law, Judicial decisions.

Surface waters flowed from plaintiffs' to defendants' property by means of a 50 year-old ditch running across both pieces of land. Defendants had attempted to fill in the ditch where it entered their property. Action was brought to enjoin defendants' interference with the flow of surface waters. In finding for the plaintiffs the Illinois Supreme Court held that where, for over fifty years and since construction of a railroad, a ditch had existed across defendants' land through which water from plaintiffs' land had drained, defendants' land was subject to a prescriptive easement of drainage. That the ditch in question was an artificial ditch rather than a natural stream was held to be immaterial. (Logan-Fla)
W69-06149

LEWIS V CLARK (CREEK BED AS PROPERTY BOUNDARY).

133 NYS 2d 880-900 (SC 1954).

Descriptors: *Boundaries (Property), *Streams, *Acreation, *New York, Lakes, Flood protection, Dredging, Channel excavation, Thalweg, Legal aspects, Judicial decisions, Gravels, Sediments, Banks, Ownership of beds, Riparian rights, Riparian lands, Beds under water, Relative rights.
Identifiers: Presumptions.

Plaintiffs sought to perpetually enjoin defendants from entering upon their lands and from dredging in or along the creek embankment constituting the common boundary between the litigants' properties. The defendants denied that the plaintiffs owned up to the center line of the creek and, therefore, alleged that the rights claimed to have been violated actually did not exist. The court held that where a deed purports to convey property bordering on a small inland body of water, a very strong presumption arises that the grantor intended to convey his ownership under water, at least to the center, and that nothing short of an express reservation will overcome the forces of such presumption. The plaintiffs were held to be seized of the creek bed subject to an easement in favor of the public for navigational purposes. A permanent injunction was issued to prevent further dredging operations. Accreted lands resulting from the defendants' dredging operations were found to inure to the plaintiffs, as such accretions accumulated on their side of the creek bed. (Katz-Fla)
W69-06150

JEFFERSON V DAVIS (OWNERSHIP OF SUBMERGED POND LAND).

25 N J Super 135, 95 A 2d 617-625 (1953).

Descriptors: *New Jersey, *Ponds, *Boundaries (Property), *Underwater, Judicial decisions, Legislation, Legal aspects, Bodies of water, Taxes, Easements, Relative rights, Real property.
Identifiers: Deeds, Land descriptions.

Plaintiffs sought to have set aside and cancelled a certificate of redemption from a tax sale of submerged pond land, and to have their tax sale certificate reinstated. The asserted ground for such relief was that defendants failed to meet statutory definition of owners entitled to redeem. The issue was whether defendants acquired title to the land beneath the pond or merely an easement to pond water. The court found for plaintiffs, holding that defendants' grantors intended to grant no more than an easement and that, therefore, defendants were not 'owners' entitled to redeem. Evidence pointing toward an intent to grant merely an easement included a prior deed which described the land conveyed as that parcel up to the edge of the mill pond, but did not describe land under the pond. (Wheeler-Fla)
W69-06151

STANDARD WAREHOUSE CO V ATLANTIC COAST LINE RR (NEGLIGENCE CONSTRUCTION AND MAINTENANCE OF A DRAINAGE SYSTEM).

71 SE 2d 893-897 (SC 1952).

Descriptors: *Discharge (Water), *South Carolina, *Pipes, *Drainage systems, Hydraulic structures, Storm drains, Surface drainage, Canals, Runoff, Storm runoff, Watercourses (Legal), Natural streams, Judicial decisions, Legal aspects, Surface waters.

Plaintiff brought suit for money damages and injunctive relief, predicated on its cause of action on the following theories: (1) that the defendant, by means of a drainage system erected along its right of way, collected surface waters in time of storm and discharged them upon the appellee's property through an open gap in its drainage pipe; (2) that the defendant constructed its railroad cut and embankment and, its drainage system in a reckless and negligent manner so as to discharge water on appellee's land; (3) that defendant diverted a natural watercourse, or a canal which had been substituted therefor, by encasing it in inadequate pipes; and (4) that defendant's inadequate drainage system and roadbed facilities constituted a nuisance, continued maintenance of which should be enjoined. These issues were submitted to a jury, and a verdict was returned in favor of the defendant. The trial judge entered judgment for the plaintiff but was reversed by the supreme court, which reinstated the jury verdict. (Katz-Fla)
W69-06152

FIFE V CHESAPEAKE AND OHIO RR (NON-LIABILITY FOR ACTS OF GOD).

307 Ky 541, 211 SW 2d 854-857 (1948).

Descriptors: *Kentucky, *Obstruction to flow, *Flooding, *Surface drainage, Culverts, Cloud-bursts, Flood damage, Judicial decisions, Backwater, Legal aspects, Damages, Relative rights, Remedies, Surface runoff, Landfills, Alteration of flow.
Identifiers: *Act of God, *Box culvert, Proximate cause.

Plaintiff brought suit to recover damages for injury to plaintiff's home and personal property caused by flooding allegedly due to defendant's negligence. Plaintiff lives in a hollow, the mouth of which was filled by defendant. A drainage culvert was then constructed. Plaintiff alleged that the culvert was wholly insufficient for natural drainage of the hollow and water backed up on plaintiff's land. At trial, defendant offered evidence to show that the damage was due to an act of God which defendant could neither control nor anticipate. The judge below directed a verdict for defendant based on the evidence adduced. The court of appeals held that where evidence showed plaintiff's land was higher than the fill and that flood waters were still several feet above plaintiff's land, no construction of the culvert could have prevented the damage caused by the act of God in the form of heavy rains. The directed verdict was affirmed. (Harris-Fla)
W69-06153

BELVEAL V H B C DEVELOPMENT CO (OBSTRUCTION OF NATURAL WATERCOURSE AND CONCENTRATION OF FLOW).

279 SW 2d 545-555 (Ct App Mo 1955).

Descriptors: *Missouri, *Obstruction to flow, *Natural streams, *Alteration of flow, Surface waters, Relative rights, Dams, Flooding, Surface

drainage, Springs, Lakes, Settling basins, Natural flow doctrine, Judicial decisions, Fish stocking, Fertilization contours, Common enemy rule, Legal aspects.

Identifiers: *Concentration of surface drainage, *Higher land, *Servient land, Upper landowner, Lower landowner.

Plaintiff alleged that a spring-fed natural watercourse originated on adjacent land and flowed over his land. Plaintiff constructed two dams at the lower end of a ravine on his land, creating an artificial lake and a settling basin to feed clear water into the lake. Plaintiff stocked and fertilized the lake, and constructed beaches on it. Plaintiff alleged defendant purchased the adjacent land above plaintiff's and in constructing a housing project and street, obstructed the natural watercourse which supplied the lake. He further alleged that defendant collected surface drainage and released it in large quantities onto plaintiff's land, causing erosion and deposit of debris in the lake. The trial court awarded damages to plaintiff. Reversing on procedural points, the court of appeals defined 'natural watercourses' as usually flowing in a particular direction, with a bed, banks and discharging into another body of water; but not surface water flowing in natural hollows after the rains. The court further stated the law that a higher landowner may not collect and concentrate the 'common enemy' surface water and release it on the servient estate. (A discussion of damages also was made.) (Harris-Fla)

W69-06154

GRISWOLD V TOWN SCHOOL DISTRICT (DAMAGE TO SPRING).

88 A 2d 829-831 (Vt 1952).

Descriptors: *Vermont, *Springs, *Eminent domain, *Underground streams, Judicial decisions, Artesian wells, Groundwater, Groundwater movement, Spring waters, Streams, Subsurface waters, Percolating water, Subsurface flow, Condemnation, Compensation, Legal aspects.

Plaintiff owned a spring and an aqueduct leading therefrom. The spring was located on defendant's land and supplied water for plaintiff's domestic use. The spring was fed by an underground stream flowing in a definite channel. Defendant, while exploring for water for a public school, exploded dynamite near the spring, diverting the flow and rendering the spring useless. The trial court dismissed plaintiff's action against defendant. In reversing the decision, this court held that the right to take water from a spring located on the land of another is a property right. Since the water supplying the spring flowed in a definite underground channel, it was not subject to the rules pertaining to percolating water. Defendant could not interfere with plaintiff's property rights by unlawful diversion of the water. The defendant could not claim governmental immunity from liability since the immunity does not apply when the injury complained of is taking private property without compensation. A property owner may only be excluded from the beneficial use of his property by eminent domain, and he must receive compensation for the exclusion. (Helwig-Fla)

W69-06155

WHEATLEY V CASS COUNTY (DIVERSION OF NATURAL FLOW OF FLOOD WATERS BY THE STATE FOLLOWED BY SUBSEQUENT RESUMPTION OF SAME FLOW).

31 NW 2d 871-875 (Iowa 1948).

Descriptors: *Floodwater, *Drainage systems, *Iowa, *Culverts, Flood control, Streams, Watersheds (Divides), Surface waters, Hydraulic structures, Drainage engineering, Water spreading, Highways, Embankments, Roadbanks, Road construction, Irrigation ditches, Grading, Judicial decisions, Legal aspects, Artificial watercourses, Natural streams.

Prior to 1937, appellant's lands were subject to periodic flooding by surface waters from an upper estate. In 1937, the state constructed a graded highway which separated the dominant and servient estates and made drainage control of the runoff feasible. Later, such control measures were actually undertaken by the appellants. Eleven years later, the county proposed to install a culvert beneath the highway. The result of this installation would be to return the servient estates to the pre-1937 norm of periodic flooding. The appellants sought injunctive relief, alleging that the county was equitably estopped from installing the culvert and that material damage would result. The trial court refused to grant the injunction. The supreme court affirmed the lower court's decision, stating that the appellants had failed to adequately demonstrate the likelihood of irreparable damage to their property in excess of the pre-1937 level. The court also held that the equitable estoppel will only be where a fraudulent act or result is established, and that reliance alone is not sufficient to constitute an estoppel. The court noted that the artificial ditch in controversy could not become a natural watercourse by passage of time since prescriptive rights cannot be claimed or urged against the public. (Katz-Fla)

W69-06156

NUNNINGHOFF V WISCONSIN CONSERV COMM'N (ACTION TO SECURE LICENSE FOR USE OF PRIVATE LAND UNDER NAVIGABLE WATERS).

255 Wis 252, 38 NW 2d 712-716 (1949).

Descriptors: *Permits, *Navigable waters, *Riparian rights, *Muskrats, Reasonable use, Farms, Beds under water, Ownership of beds, Dams, Streambeds, Natural use, Running water, Standing waters, Judicial decisions, Wisconsin, Legal aspects, Water law, Submerged lands.

Appellant challenged appellee's right to a license to operate a muskrat farm utilizing part of the navigable waters of the Wisconsin River. The lands under the navigable waters were owned by appellee; the waters had become navigable due to construction of a dam downstream from appellee's land. Appellant, the state conservation commission, contended that the statute authorizing licensing of lands for muskrat farms was intended to include only those under private waters. The court found that the waters in question were navigable since they were usable for limited navigation during certain periods of the year. The court held, however, that a riparian owner has the right to make reasonable use of abutting navigable waters, and that, since appellee owned the submerged land, he could use it for the purpose of muskrat farming. Use of the bed for float trapping was found not to be incident to navigation. The court decided that appellee's use of the land and waters would not restrict navigation and permitted the licensing. (Kelly-Fla)

W69-06157

STATE V LONGYEAR HOLDING CO (ACTION TO DETERMINE RIGHTS TO ORE BEHIND LAKE BED).

29 NW 2d 657-673 (Minn 1947).

Descriptors: *Navigable waters, *Riparian rights, *Ownership of beds, *Property boundaries, Judicial decisions, Minnesota, Low water mark, Watercourses (Legal), Accretion (Legal aspects), Lakes, Mining, Public benefits, Beds under water, Channels, Iron, Docks, Legal aspects, State governments, Contracts.

The State of Minnesota brought this action to determine the merit of adverse claims to a lake bed below the low water mark. The state had made an agreement with a mining company whereby the company was to temporarily drain the lake, mine deposits of iron ore from its bed, and refill it. This court upheld the lower court's decision that the state had absolute rights to the ore on the ground that the lake was a navigable watercourse under the state's control. The court determined navigability

by the de facto capability of the lake to support water traffic. The fact that the usability of the lake for navigation was limited and that, in fact, the lake was not used for navigation had no bearing since capability of use, rather than actual use, is the controlling test. The riparian owners were found to be entitled to compensation for deprivation of their right to use the lake. Their claims to royalty proceeds from the mining operations, however, were dismissed since they have no vested interest in the lake bed itself. (Kelly-Fla)

W69-06158

CARPENTER V OHIO RIVER SAND AND GRAVEL CORP (ACTION TO ENJOIN DREDGING ON PROPERTY BELOW PRESENT WATER LINE, BUT ABOVE OLD LOW WATER MARK).

60 SE 2d 212-217 (W Va 1950).

Descriptors: *Boundaries (Property), *Low water mark, *Ohio River, *Riparian lands, Surveys, West Virginia, Judicial decisions, Dredging, Beds under water, Federal government, Dams, Riparian rights, Locks, Navigable waters, Legal aspects, High water mark, Rivers, Sands, Banks.

Plaintiff, a riparian owner, sought to enjoin defendant corporation from dredging sand and gravel which allegedly was located on plaintiff's property. The supreme court found for the plaintiff, holding that plaintiff's land extended to the low water mark of the Ohio River. The low water mark was defined as the lowest level of the river prior to construction of certain locks and dams by the federal government. The trial court erred in measuring the low water mark since it used surveys conducted subsequent to the dam and lock erection. The supreme court reversed and remanded, directing the lower court to enjoin further dredging and to make specific findings on the issue of damages. (Kelly-Fla)

W69-06159

KIMBERLY V PRESLEY (TITLE TO ACCRETED MATERIALS).

245 SW 2d 72-75 (Miss 1952).

Descriptors: *Missouri, *Boundaries (Property), *Accretion (Legal aspects), *Banks, Riparian rights, Riparian land, Legal aspects, Judicial decisions, Streams, Erosion, Remedies, Scour, Degradation, Alluvium, Silts, Colluvium, Relative rights, Islands.

Plaintiff brought action in ejectment and to quiet title to certain accreted land lying between defendants' island which was situated in a river, and plaintiff's land, which abutted on the river. The trial court held that title to the accreted land was in defendants, and the supreme court affirmed. The supreme court opinion focused on the narrow factual determination of to whom the lands in question accreted. The evidence demonstrated that the accretions were silt deposited by slough and river waters, and that they were peculiarly attributable to dredging and sand pumping operations carried on by the government. These accreted materials were found to be property of the defendant island owned. (Katz-Fla)

W69-06160

BEGNAUD V GRUBB AND HAWKINS (ACTION TO DETERMINE NAVIGABILITY OF BAYOU AS TEST OF OWNERSHIP).

209 La 826, 25 So 2d 606-619 (1946).

Descriptors: *Louisiana, *Navigable water, *Non-navigable waters, *Ownership of beds, On-site investigations, Judicial decisions, Legal aspects, Silt-ing, Sedimentation, Saline water, Riparian rights, Riparian lands, Mapping, Peat, Soil erosion, Geologic formations.

The basis of appellee's original claim was that a bayou passing through his land was not a navigable

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stream and, therefore, that the title to the streambed vested in him rather than in the state. The supreme court agreed that if the stream was non-navigable the riparian owner was entitled to ownership of the bed to the thread or middle of the stream. The court traced the chain of title to the land in question and found that appellee's deed was valid. The court then examined and discussed extensive evidence regarding the navigability of the bayou in 1812, when Louisiana entered the Union. Appellant urged that the effects of erosion, the increase of water salinity, and the presence of fossil layers indicated that the bayou was navigable in 1812 and that the title to the bed should remain in the state. The court, however, found appellee's evidence was more convincing and held that the bayou was disconnected from the river, shallow, choked with vegetation, and that it had been in this condition for hundreds of years. Judgment for appellee was affirmed. (Kelly-Fla)
W69-06161

KEYTON V MISSOURI-KANSAS-TEXAS RR (ACTION FOR DAMAGES CAUSED BY OBSTRUCTING NATURAL FLOW OF SURFACE WATER).

224 SW 2d 616-623 (Ct App Mo 1949).

Descriptors: *Obstruction to flow, *Flood damage, *Surface waters, *Missouri, Drainage engineering, Drainage, Floods, Natural flow, Ditches, Water conveyance, Hydrologic cycle, Water levels, Snow, Rain, Springs, Soil erosion, Judicial decisions, Legal aspects, Surface runoff.

Appellant brought this action against appellee railroad, alleging that appellee's roadbed was constructed above ground level and that it acted as a dam, causing water to back up over appellant's fields and ruin his crops. Appellant further contended that an improperly designed culvert built by appellee was not adequate to handle the water flow and to conduct it into natural drainage ditches on the other side of the roadbed; this condition eventually caused washouts and soil erosion on that side. Appellant's defended on the ground that appellee's land would have been flooded by unobstructed surface water whether the roadbed existed or not, and that natural drainage was inadequate to handle this surface water. The appellate court found that appellee's defense was too generally stated and that the jury had been improperly instructed. The court distinguished 'surface waters' from 'general overflow,' stating that indiscriminate use of these terms results in confusion of the jury. The former term refers to all water diffused over the ground and not in any natural watercourse; the latter term includes only surface waters which overflow from a natural watercourse. (Kelly-Fla)
W69-06162

CASANOVER V VILLANOVA REALTY CO (DIKE REMOVAL AND RUNOFF).

209 SW 2d 556-560 (Ct App Mo 1948).

Descriptors: *Surface runoff, *Overland flow, *Silt, *Missouri, Diversion dam, Dikes, Erosion, Slopes, Runoff, Sediments, Clays, Drainage systems, Legal aspects, Judicial decisions, Easements, Floods, Grading, Repulsion (Legal aspects), Relative rights, Riddance (Legal aspects).

Plaintiff brought action seeking an injunction to restrain defendant from permitting flowage of surface water and silt from its land onto the plaintiff's lower land and to recover for injuries previously caused by such flowage. Plaintiff also sought to recover for an alleged trespass by the defendant in connection with certain grading activities which set the flow in motion. The court recognized that the 'common enemy' doctrine applied in Missouri. That doctrine recognizes the right of a landowner to protect his property from surface water flow by whatever means possible, even though by such actions he should divert water onto the land of his neighbor. This right is qualified in that the owner of higher land cannot collect the surface water and

then discharge it upon his neighbor's estate. The court awarded damages for the trespass which occurred during the grading operations and denied injunctive relief as to future flowage. The evidence indicated that steps had been taken by defendant to prevent such future flowage. Damages for flooding were not awarded due to appreciation of the common enemy doctrine. (Katz-Fla)
W69-06163

TOBIAS V TOBIAS (SUIT TO ENJOIN EXERCISE OF RIPARIAN RIGHT TO FISH IN LAKE).

345 Mich 263, 75 NW 2d 802-804 (1956).

Descriptors: *Michigan, *Riparian rights, *Lakes, *Fishing, Water law, Judicial decisions, Bodies of water, Ownership of beds, Iced lakes, Boundary disputes, Recreation, Riparian land, Riparian waters, Third party effects, Legal aspects.

Identifiers: Injunctions (Mandatory), Estoppel.

Plaintiffs brought suit in equity to enjoin defendants from exercising their riparian right to fish in a lake. Dispute arose when defendants, who owned land adjacent to plaintiffs' allowed others to fish in the lake. The issue at trial was whether the lake shore was owned completely by plaintiff. A fence had been placed on winter ice, separating defendants' property from the larger portion of the lake. The trial court ruled in favor of defendants. On appeal, plaintiffs contended that defendants' acquiescence in the erection of the fence estopped them from asserting any riparian rights at this point. The appellate court affirmed the lower court, holding that evidence was sufficient to support a finding that defendants owned some part of the lake shore and that riparian rights attaching by virtue of such ownership included the right to allow others to fish in the lake. The court dismissed the estoppel claim, ruling that plaintiffs had not shown detrimental reliance on defendants' failure to assert his rights. Further, the record tended to show that the parties mutually undertook to erect the fence in order to keep defendants' cattle from crossing the lake and that the strand wire construction did not prevent others from entering the lake. (Wheeler-Fla)
W69-06164

IMPROVED REALTY CORP V SOWERS (ADVERSE POSSESSION OF POND).

195 Va 317, 78 SE 2d 588-593 (1953).

Descriptors: *Virginia, *Prescriptive rights, *Relative rights, *Non-navigable waters, Ponds, Competing uses, Riparian land, Lake fisheries, Negotiations, Boating, Fishing, Legislation, Riparian rights, Boundaries (Property).

Identifiers: *Adverse possession, *Statute of limitations, Marketable title.

Plaintiff vendor brought suit for specific performance of a written contract for the sale of real estate adjoining a fish pond. While plaintiff had no record title to the pond, he claimed ownership by prescription of the exclusive fishing rights. The parcels of land surrounding the pond were owned by several different persons. The court noted that this fact made the establishment of prescriptive rights by plaintiff peculiarly difficult of proof. In the case of inland lakes where the titles of the several riparian owners include the land covered by the water, they may, together with their lessees and licensees, use the surface of the lake for boating and fishing, so long as they do not interfere with the reasonable use of the water by other riparian owners. Since this is so, the evidence of possession here does not establish such title as equity ought to compel the defendant to accept. Possession and use of the surface of the lake by Plaintiff is consistent with his rights as a riparian owner and is not, in this situation, such open and notorious adverse use as to start the running of the prescriptive period. (Reed-Fla)
W69-06165

CITY OF MACON V CANNON (SURFACE WATER RUNOFF).

89 Ga App 484, 79 SE 2d 816-826 (1954).

Descriptors: *Georgia, *Storm drains, *Flooding, *Drainage water, Subsurface drains, Drainage engineering, Highways, Roadbeds, Drainage systems, Overland flow, Natural flow doctrine, Precipitation excess, Rainwater, Storm runoff, Legal aspects, Judicial decisions, Local governments.

Plaintiff brought action to recover for damages resulting from defendant city's maintenance of a sewer beneath plaintiff's land which lacked the capacity to handle increased surface runoff. Judgment was entered for the plaintiff and city appealed. The reviewing court affirmed the lower court, holding that the evidence presented by the plaintiff was sufficient to establish: (1) that plaintiff's premises became flooded even during normal rain due to the inadequate capacity of the sewer; (2) that the paving of a nearby highway greatly increased the runoff into the sewer in question; and that (3) the city was guilty of maintaining a nuisance by failure to enlarge the sewer system after notification by plaintiff of the increased flowage into the sewer. (Katz-Fla)
W69-06166

TAYLOR V HARRISON CONSTR CO (ARTIFICIAL INCREASE OF SURFACE WATERS).

178 Pa Super 544, 115 A 2d 757-760 (1955).

Descriptors: *Pennsylvania, *Drainage water, *Surface waters, *Invasion, Drainage systems, Surface runoff, Groundwater, Rainfall-runoff relationships, Diffused surface water, Precipitation excess, Slopes, Storm runoff, Standing waters, Earth fills, Judicial decisions, Legal aspects.

Identifiers: *Negligence, *Upper landowners, *Lower landowners.

Plaintiffs brought suit to recover damages for invasion of the use and enjoyment of their land caused by defendant's interference with the flow of surface water. While constructing a plant near the foot of a hill below the plaintiffs' property, the defendant attempted to obtain permission to deposit excavated dirt on the property of all the neighboring landowners. The plaintiffs refused and as a consequence a bank of earth was erected along the base of plaintiffs' property. It was then necessary for defendant to install drain pipes at considerable expense to provide drainage from the higher ground. Nevertheless, the flow of the surface water was sometimes impeded during heavy rainfall causing pools of water to accumulate on the plaintiffs' property. The court upheld the trial court ruling in favor of the defendant on the basis of the jury finding that the invasion was neither intentional nor unreasonable. The defendant did not obstruct the natural flow nor did he gather surface water and discharge it upon the land of the plaintiffs. A lower landowner may shut out the flow of surface water without liability to an upper landowner so long as he does not proceed negligently. (Stewart-Fla)
W69-06167

RICHARDSON AND BASS V BOARD OF LEVEE COMM'RS OF THE ORLEANS LEVEE DIST (ADVERSE POSSESSION).

226 La 761, 77 So 2d 32-39 (1954).

Descriptors: *Louisiana, *Mississippi River, *Boundaries (Property), *Prescriptive rights, Riparian rights, Riparian lands, Easements, Administrative agencies, Streams, Real property, Remedies, Hydraulic structures, Spillways, Mineralogy, Judicial decisions, Legal aspects.

Identifiers: Concordus proceeding.

Plaintiff brought a concrusus proceeding to determine which of two rival claimants was entitled to certain mineral royalties by virtue of being the true owner of a certain piece of land. The defendants

claimed the disputed property through their remote ancestor, and the court admitted that their chain of title was clear. The defendant Levee Board claims the property by adverse possession, asserting that the defendant had not disturbed the maintenance by the Board of a spillway on the property during the prescriptive period. The court found for the defendant, stating that there are certain showings which must be made in order to establish title by adverse possession. These are: (1) good faith on part of the possessor; (2) a little translatable of the property; (3) possession during the time required by law; and (4) an object which may be acquired by prescription. The court held that the Board had failed to demonstrate that it was possessed of title translatable of the property and that it had acted in good faith. (Katz-Fla)
W69-06168

LYDA V TOWN OF MARION (UNAUTHORIZED DRAINAGE DITCHES HELD TAKING OF PRIVATE PROPERTY FOR PUBLIC USE).

239 NC 265, 79 SE 2d 726-730 (1954).

Descriptors: *North Carolina, *Road construction, *Damages, *Ditches, Compensation, Relative rights, Legal aspects, Culverts, Drainage, Local governments, Land tenure, Judicial decisions, Eminent domain, Condemnation.
Identifiers: Inverse condemnation, Limitation of actions.

Plaintiff property owners brought action for damages allegedly caused by defendant town's street paving operations. Plaintiffs alleged that defendant's workmen constructed culverts and ditches across his land without permission. As a result of the ditching, water was cast onto plaintiffs' land causing injury thereto and allegedly amounting to a partial 'taking' thereof by defendant. Prior to the paving, water ran off the property all along the street and was not concentrated upon plaintiffs' lot. Defendant contended that the claim was barred by a provision in the town charter requiring notice of injury within 180 days. The superior court held for defendant. On appeal, the supreme court held that plaintiffs had failed to make out a case for relief in respect to alleged casting of waters upon the land, since they were barred from asserting a cause of action for continuing trespass by virtue of the limitation clause. The court upheld the second cause of action based on a partial taking of land by the digging of unauthorized drainage ditches. The court reasoned that the town charter limitation did not apply to a claim arising out of physical appropriation of private property for public use. (Harris-Fla)
W69-06169

GREENBURG V CITY OF STEUBENVILLE (DAMAGE CAUSED BY AN ACT OF GOD AND CONCURRENT NEGLIGENCE).

72 NE 2d 125-128 (Ohio Ct App 1945).

Descriptors: *Ohio, *Drainage, *Obstruction to flow, *Diversion, Damages, Legal aspects, Culverts, Cities, Excessive precipitation, Flood damage, Judicial decisions, Precipitation excess, Diversion structures.
Identifiers: *Act of God, *Negligence, Proximate cause, Finding of fact.

Plaintiff sought to recover for injury to two dwellings. The damage was allegedly caused by defendant's obstruction and diversion of a waterway used for drainage and sewage collection. Plaintiff contended that defendant's officers had knowledge that the waterway was in a state of disrepair. Defendant answered, asserting that the walls of plaintiff's dwellings extended into and over the waterway, causing the channel to narrow. Defendant contended that this rendered the waterway insufficient to accommodate rainfall which injured plaintiff's property. A jury returned a verdict for defendant.

The court of appeals held that if it could be established that the injury to the plaintiff's property would not have occurred in absence of defendant's negligence, the defendant would be liable. But if the superior force would have caused the damage with or without the negligence, then the defendant's negligence could not be said to have been the direct and proximate cause of the injury and defendant could not be held liable. The court found that the evidence was not sufficient to show an improper finding by the jury below and affirmed the lower court. (Harris-Fla)
W69-06170

ACCURATE DIE CASTING CO V CITY OF CLEVELAND (FLOOD DAMAGE FROM SUB-SURFACE DRAINAGE).

113 NE 2d 401-407 (Ohio Ct App 1953).

Descriptors: *Ohio, *Flood damage, *Cities, *Sewers, Drainage systems, Judicial decisions, Flood control, Flood protection, Overflow, Storm drains, Excessive precipitation, Natural flow, Sub-surface drainage, Surface waters, Drainage waters, Local governments, Outlets.
Identifiers: *Evidence, Proximate cause.

The plaintiff brought suit to recover for the flooding of his manufacturing plant, allegedly caused by the defendant's negligent sewer construction. The court found that the sewer outlets were not large enough to handle the accelerated water flow from a heavy rainfall. As a result of this condition, water was cast upon plaintiff's land in substantial quantities. The court found that the inadequacy of the drain to handle the accelerated waterflow was the proximate cause of the flooding and entered judgment for the plaintiff. (Stewart-Fla)
W69-06171

TENNESSEE COAL, IRON AND RR V RAY (MINING OPERATION CAUSES DESTRUCTION OF WATER SUPPLY).

28 So 2d 726-729 (Ala 1946).

Descriptors: *Alabama, *Mining, *Water-wells, *Damages, Water supply, Compensation, Land tenure, Legal aspects, Water loss, Judicial decisions.
Identifiers: *Before and after test, Pleading.

As a result of coal mining operations by the defendant, plaintiff's water-well went dry. This left plaintiff's land and dwelling without a water supply unless water was hauled in from the nearest town. No question of liability was raised; it was conceded that the mining operation caused the damage. The supreme court upheld a jury verdict determining the amount of damage by use of the 'before and after test.' Evidence of the value of the land with and without water was conflicting, but the court permitted the jury to base their verdict on their own experience. The court held that compensation for annoyance, discomfort, and inconvenience suffered by the plaintiff was proper if allegations relating thereto were properly pleaded. (Harris-Fla)
W69-06172

GENERAL GEOPHYSICAL CO V BROWN (DESTRUCTION OF WATER-WELL BY GEOPHYSIC EXPLOSIONS).

38 So 2d 703-706 (Miss 1949).

Descriptors: *Mississippi, *Exploration, *Explosions, *Water wells, Damages, Oil industry, Geophysics, Legal aspects, Land tenure, Relative rights, Water loss, Judicial decisions, Permits, Explosives, Seismic studies, Drilling, Seismic waves.
Identifiers: *Trespass, *Negligence, License.

Plaintiff sought damages for the destruction of a water-well on his farm by explosives set off at an unauthorized point on plaintiff's property. Plaintiff

alleged that defendant's limited license to make geophysical explorations for oil did not sanction the use of explosives in an area near the well. The defendant geophysical company nevertheless exploded its 'shot-point' 550 feet from the well, and, by virtue of such explosion, plaintiff's well was destroyed. Loss of the well greatly reduced the value of plaintiff's farm land. Following introduction of evidence tending to show that the well had ceased to produce and that wells in general in the area became difficult to tap, the jury found damages in amount of \$1000. The Supreme Court affirmed, holding that proof of damage after violation of a limited license sustained a contention that the defendant was a trespasser ab initio. He was thus liable for any damage to the well without regard to the degree of care exercised in his exploration. (Harris-Fla)
W69-06173

CITY OF JACKSON V COOK (COMPENSATION FOR DAMAGES FROM NEGLIGENCE DISPOSAL OF DRAINAGE WATER).

58 So 2d 498-504 (Miss 1952).

Descriptors: *Eminent domain, *Mississippi, *Drainage water, *Flood damage, Surface runoff, Ditches, Paving, Storm drains, Cities, Drainage, Damages, Compensation, Pipes, Surface waters, Conduits, Judicial decisions, Discharge (Water), Flooding, Legal aspects.
Identifiers: Constitutions, Negligence.

Plaintiffs owned land within the city of Jackson. In paving a street, defendant built a storm sewer to carry water from the street. The drainage water was discharged upon the surface of the ground some 50 feet from plaintiffs' land, causing damage. Plaintiffs brought suit, alleging that defendant, by causing flooding had taken the plaintiffs' property for a public use and was liable for damages under the state constitution. Defendant's motion to require an election of a cause of action was denied. Judgment was entered for plaintiffs. On appeal, the court held that since the negligence charge was an enlargement of the charge of taking without negligence, the two were not inconsistent. The court held that whether the drain pipe emptied into a ditch or onto the ground, and whether the water in fact flooded plaintiffs' land were questions for the jury. If the water drained onto the ground, such disposal was negligent, and anyone damaged thereby had a right to recover on a negligence theory. (Helwig-Fla)
W69-06174

DUVALL V 20TH CENTURY COAL CO (PERCOLATING WATERS).

104 F Supp 725-729 (W D Ky 1952).

Descriptors: *Kentucky, *Drainage water, *Percolation, *Strip mines, Underground mines, Coal mines, Infiltration, Subsurface drainage, Mine water, Mine drainage, Damages, Ditches, Drains, Rainfall, Groundwater movement, Judicial decisions, Legal aspects.
Identifiers: Negligence, Proximate cause, Burden of proof.

Plaintiff brought suit to recover for the destruction of his underground mine. Inundation of the mine was allegedly caused by water from the defendant's ditch. The ditch, containing several feet of accumulated water, was a result of the defendant's adjacent strip mining operations. It was alleged that the percolation of water from the defendant's ditch caused the roof of plaintiff's mine tunnel to fall. The court held that the defendant had a right to the enjoyment of his land. He could use it for any purpose so long as such use did not interfere or invade the rights of his neighbors. The burden was on the plaintiff to prove that the water from the defendant's ditch was the direct and proximate cause of the damage. The origin of percolating water is ex-

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tremely difficult to establish. The court entered judgment for the defendant on the ground that plaintiff failed to sustain his burden of proof. (Stewart-Fla)
W69-06175

PETER WENDEL AND SONS V CITY OF NEWARK (DAMAGE FROM ARTIFICIAL DRAINAGE SYSTEM).

46 A 2d 793-794 (NJ Ct Ch 1946).

Descriptors: *New Jersey, *Drainage systems, *Surface drainage, *Storm drains, Cities, Streams, Drainage water, Drainage, Laterals, Artificial watercourses, Ditches, Riparian rights, Outlets, Urbanization, Surface runoff, Culverts, Storm runoff, Navigable waters.

Plaintiff's land was located downstream from defendant's storm drain outlet. Prior to 1928, drainage water from the outlet traveled over undeveloped farm land and emptied into 2 natural brooks. By the time the water reached plaintiff's land, it was in a navigable state. In 1928, defendant constructed a surface drainage system causing the drainage water to flow in greater quantity and force, inundating portions of plaintiff's land. The court held that where a city deliberately enters upon a scheme of drainage and, by artificial means, casts drainage water on private property which would not otherwise receive such water, it commits a wrong which equity will restrain. (Helwig-Fla)
W69-06176

MAYOR OF AMERICUS V BRIGHTWELL (SURFACE DRAINAGE AND ALTERATION OF FLOW).

90 Ga App 341, 82 SE 2d 732-735 (1954).

Descriptors: *Alteration of flow, *Georgia, *Surface drainage, *Flood damage, Natural flow, Local governments, Rainfall, Surface waters, Obstruction to flow, Watercourses, Diversion, Routing, Cities, Diversion structures, Natural flow doctrine, Drainage water, Topography, Judicial decisions, Legal aspects.

Plaintiff brought action to recover for damage to her land. She alleged that the regrading of an adjacent street had diverted drainage water from its natural course and caused it to flow upon her land in unusual quantities. The defendant contended that the flow was due to the natural topography. The court entered a judgment for the plaintiff. It found that the defendant had gathered the water and diverted it from its natural course onto the land of the plaintiff. Consequently, the defendant was liable for resulting damage to the property. (Stewart-Fla)
W69-06177

AMERICAN BARGE LINE V KOONTZ (TAXATION OF INTERSTATE AND INTRASTATE COMMERCE OVER NAVIGABLE WATERS).

68 SE 2d 56-64 (W Va 1951).

Descriptors: *West Virginia, *Taxes, *State governments, *Transportation, Navigable waters, Income, Judicial decisions, Interstate rivers, Ohio River, Federal government, Legislation, Boats, Regulation, Permits.

Identifiers: *Common carriers, *Interstate commerce, Taxing power, Privilege tax.

Plaintiff brought an action to determine whether a tax on the transportation of freight and passengers on navigable waters was valid. The plaintiff was a common carrier engaged in the transportation business on navigable waters. His business included both interstate and intrastate deliveries. The defendant imposed an annual privilege tax on the gross income from the business. The plaintiff contended that the tax was not a lawful exaction under the defendant's taxing power. This contention was based on the fact that the plaintiff had no office in West

Virginia nor was any employee stationed there. In addition, since the plaintiff was licensed by the Interstate Commerce Commission, he argues that he was subject to federal laws and regulation. However, the court ruled that, despite the exclusive authority of the federal government to license vessels using navigable waters, certain taxes may be levied and collected by the state. However, the court concluded that the state cannot tax gross income derived from plaintiff's interstate activities. Such a tax would be an unreasonable burden on interstate commerce. The tax imposed on gross income from purely intrastate business was held valid. (Stewart-Fla)
W69-06178

CITY OF JACKSON V ROBERTSON (INJUNCTION AGAINST DISCHARGING DRAINAGE UPON LOWER PROPERTY).

44 So 2d 523-525 (Miss 1950).

Descriptors: *Mississippi, *Surface runoff, *Drainage systems, *Flow augmentation, Surface waters, Overlying proprietor, Drainage water, Culverts, Ditches, Storm drains, Pipes, Legal aspects, Judicial decisions, Relative rights, Riddance (Legal aspects), Jurisdiction, Cities, Flood damage, Flooding, Alteration of flow, Roads.
Identifiers: *Injunction (Mandatory).

Plaintiff owned land which was bounded by public roads and a railway. In 1929, defendant city installed a culvert under one of the roads. The culvert carried drainage water onto plaintiff's lot. The culvert, because it often became clogged, was replaced by a larger drain which increased and accelerated the flow. To remedy this condition, the state and the city installed a still larger culvert which was designed to carry off, by means of a ditch, water flowing onto plaintiff's lot. The new system included a small intake pipe which was to carry water from the drain under the road into the new culvert. The subsequent development of a nearby residential area caused an increase in the flow to the culvert under the road. The intake of the culvert was inadequate to carry off the increased flow with the result that plaintiff's lot was inundated after each heavy rain. The lower court granted plaintiff the mandatory injunction prayed for and commanded that the city adopt measures to prevent the flooding. The appellate court affirmed, holding that no municipal board has the right to create a public nuisance. It further held it is not essential that negligence be shown in order for relief to be granted. (Wheeler-Fla)
W69-06179

CRARY V STATE HIGHWAY COMMISSION (TAKING OF STATUTORY RIPARIAN RIGHTS).

68 So 2d 468-472 (Miss 1953).

Descriptors: *Mississippi, *Riparian rights, *Legislation, *Eminent domain, Condemnation, Oysters, Structures, Riparian land, Legal aspects, Judicial decisions, Bridge construction, Ownership of beds, Public benefits, Damages, Relative rights, Navigable waters, Navigation, State governments, Administrative agencies, Compensation.

A state statute granted to riparian owners along the Gulf of Mexico and the Mississippi Sound the exclusive right to plant and gather oysters and to erect structures up to 500 yards from the shore line. The state began construction of a bridge across the Bay of St. Louis within 500 yards of plaintiff's shoreline. Plaintiffs brought suit against the state alleging that construction of the bridge constituted a taking of their property for a public use in that construction of the bridge at such a location effectively destroyed the riparian rights granted by the statute. The appellate court affirmed a lower court's decision in favor of defendants. The court held that the statute granted only a revocable license which was necessarily subject

to the superior right of the state to impose an additional public use upon such property already set aside for a public purpose. The exercise of such right was not a 'taking' requiring the payment of compensation. The court said the statute must be interpreted in light of a section of the state constitution prohibiting the legislature from authorizing the permanent obstruction of any navigable state waters and providing for removal of obstructions whenever the public welfare demands. (Wheeler-Fla)
W69-06180

RESORT DEVELOPMENT CO V PARMLE (OWNERSHIP OF LAND COVERED BY NAVIGABLE WATERS).

235 NC 689, 71 SE 2d 474-480 (1952).

Descriptors: *North Carolina, *Navigable waters, *Public lands, *Ownership of beds, Tides, Bays, Property boundaries, Judicial decisions, Tidal waters, Inlets, Shores, Legislation, State governments, Real property.
Identifiers: *Marketable title, Land-sales contracts.

Plaintiff brought action to compel specific performance of a land sales contract. Defendant contended that the plaintiff did not have a clear and marketable title. The land is located on a sound. At high tide, the land is entirely covered by navigable waters. The court found in favor of the defendant. Its decision was based on the common law rule that beds under navigable waters are owned by the state. In addition, a state statute made it unlawful to enter or convey any land covered by navigable waters. As a result, the court held that the plaintiff could not convey good title to the property since he himself had never received title. The land belonged to the public. (Stewart-Fla)
W69-06181

HOLDEN V MOSER (SURFACE DRAINAGE EASEMENTS).

175 Pa Super 206, 103 A 2d 464-467 (1954).

Descriptors: *Pennsylvania, *Roads, *Surface drainage, *Easements, Judicial decisions, Surface runoff, Relative rights, Drainage systems, Obstruction to flow, Legal aspects, Right of way, Real property.
Identifiers: Injunctions (Prohibitory).

Plaintiff and defendant purchased adjacent land from a common grantor. These parcels of land were once part of a single tract which was divided when the grantor constructed a road separating the two lots. Defendant's northerly portion was made subject to the grantor's right to drain surface water from other portions of the grantor's estate, including the parcel subsequently conveyed to plaintiff. Plaintiffs sought an injunction to restrain any attempt to deny plaintiffs the use of the easement. The court held that the injunction should not issue. The easement to which defendant's land was subjected was not intended to benefit plaintiff's land because at the time it was created plaintiff's land lay beyond the roadway constructed by the common grantor, which created a natural barrier to drainage. (Molica-Fla)
W69-06182

KLOCK V RUSNACK (VALIDITY OF WATER USE EASEMENT).

164 Pa Super 67, 63 A 2d 377-380 (1949).

Descriptors: *Pennsylvania, *Easements, *Springs, *Water rights, Judicial decisions, Adjudication procedure, Legal aspects, Water contracts, Fresh water, Spring waters.
Identifiers: Deeds.

Representatives of a church brought an action in equity to enjoin the defendants from interfering with the plaintiff's right to use water from a spring

on the defendants' land. The defendants had conveyed the plaintiff's lot to it with an easement to use a spring on the defendants' property. After an order of injunction had been rendered in favor of the plaintiff, plaintiff conveyed its land to a third party. The defendants then petitioned for an order restraining the purchasers from taking water from the spring. The trial court granted the defendants' petition, but the Superior Court of Pennsylvania reversed the lower court. The superior court held that the water rights inured to the benefit of the purchasers of the tract belonging to the church, regardless of the fact that no reference to the water rights was contained in the deed to the purchasers. An easement created by a grant or its equivalent is not lost by failure of a particular deed in the chain of title to refer to the easement. (Watson-Fla) W69-06183

CLOUGH V STATE (ARTIFICIAL DIVERSION OF NATURAL WATERCOURSES).

208 Misc 499, 144 NYS 2d 392-398 (Ct Cl NY 1955).

Descriptors: *New York, *Natural streams, *Diversion structures, *Appropriation, Judicial decisions, Water rights, Routing, Alteration of flow, Flood control, Natural flow doctrine, Obstruction to flow, Eminent domain, State governments, Riparian rights, Stream flow, Compensation, Watercourses, Structures.

Plaintiff brought suit for damages caused by the defendant's diversion of a creek by the construction of a flood control project. The plaintiff operated a sand and gravel processing plant which was dependent upon a continuous flow of the creek. As a result of the temporary diversion, the plaintiff was forced to shut down his plant. The court rendered a judgment for the plaintiff. It held that because of the diversion of the waters from their natural course, the defendant made a temporary appropriation for which it must make compensation. The court also found that the plaintiff, through lease and contract agreements, had a property interest in the creek and the use of its waters. (Stewart-Fla) W69-06184

CHESAPEAKE BAY BRIDGE AND TUNNEL DIST V LAURITZEN (ACTION FOR DAMAGES TO SHIP CAUSED BY STRIKING SUBMERGED TOWER).

404 F 2d 1001-1008 (4th Cir 1968).

Descriptors: *Virginia, *Tunnels, *Navigation, *Admiralty, Channels, Navigable waters, Charts, Judicial decisions, Legal aspects, State governments, Damages, Remedies, Relative rights, Ships, Low water mark, Bays. Identifiers: Chesapeake Bay.

Appellee sued the tunnel district for damages caused when its ship struck a submerged light tower affixed to appellant's tunnel beneath Chesapeake Bay. The lower court found that a negligence action could be maintained against the state, that the tower had been negligently maintained and that compensation for damages should be paid. The court of appeals, however, held that the appellee had been contributorily negligent. The ship's master had turned control of the vessel over to a harbor pilot who failed to use any of the navigation devices available to him, relying only on visual markers in the channel. The master, according to the court, was also negligent for failure to post a bow lookout. A lookout could have observed that the vessel was leaving the center of the channel. Since both the master and the tunnel district were negligent, the court apportioned damages according to the applicable rule of admiralty law. (Kelly-Fla) W69-06185

SOUTHERN RR V JEFFERSON (FLOODING ABOVE RAILROAD FILL).

185 Va 384, 38 SE 2d 334-336 (1946).

Descriptors: *Virginia, *Floods, *Culverts, *Railroads, Flood damage, Damages, Maximum probable flood, Overflow, Flood protection, Alteration of flow, Judicial decisions, Legal aspects, Drainage, Rain, Streams, Natural flow, Natural streams.

Identifiers: Negligence, Proximate cause, Act of God, Duty to act.

Plaintiff brought an action for loss of his barn which was washed away by high waters. Plaintiff maintained that the high waters were caused by the railway company's negligence in not providing a larger culvert under its tracks. The trial court held for the plaintiff, but the Supreme Court reversed. The court stated that although the railway had a duty to provide an adequate culvert to accommodate the natural flow and such abnormal flow as may reasonably have been anticipated, it was not required to anticipate and provide against unprecedented floods and high water. The evidence was sufficient to show that the direct and proximate cause of the loss of the barn was an unprecedented flood which could not reasonably have been anticipated. In addition, the barn would have been lost if there had been no culvert or railway. (Watson-Fla) W69-06186

KENNEDY V UNION ELECTRIC CO OF MISSOURI (SILT ACCRETION AND FLOODING).

216 SW 2d 756-764 (Mo 1948).

Descriptors: *Missouri, *River beds, *Flood damages, *Dams, Upstream, Channels, Roughness (Hydraulic), Waterflow, Silts, Sedimentation, Riparian rights, Riparian lands, Flooding, Floodwater, Real property, Hydraulic structures, Reservoirs, Legal aspects, Lakes, Streams, Judicial decisions, Precipitation excess, Excessive precipitation, Overland flow.

Identifiers: *Act of God.

Defendant constructed a dam across the Osage River creating a large reservoir known as the Lake of the Ozarks. Plaintiff brought action for damages, contending that the impounding of this body of water slowed the rate of flowage in the Osage River and its tributaries, resulting in the accumulation of great silt deposits in the river and its tributaries. This silt accumulation reportedly raised the stream beds and therefore retarded flowage causing an unprecedented overflow during the year 1943, such overflow flooding plaintiff's building. Defendant disclaimed liability as to damages on the premise that the extraordinary rains of 1943 were *vis major*. The court recognized that under local law, the term act of God applies only to events so extraordinary in history that no reasonable warning against such events is possible. The court also determined that an act of God combining with an act of man does not exonerate the human actor from liability for ensuing damages. (Katz-Fla) W69-06188

RONADE ASSOCIATES V DEPARTMENT OF CONSERVATION (DENIAL OF PERMIT TO CONSTRUCTION BUILDING ACROSS STREAM).

7 NJ Super, 72 A 2d 355-360 (NJ Super Ct 1950).

Descriptors: *New Jersey, *Administrative agencies, *Public interest, *Buildings, Legislation, Legal aspects, Construction, Flood control, Permits, Regulation, State governments, Construction, Alteration of flow, Streams, Ownership of beds, Cities, Structures, Water policy, Administrative regulation.

Appellant filed application with the State Department of Conservation and Economic Development

for a permit to construct a building over a small stream. A supporting pier in the middle of the stream was required. The stream flowed through appellant's tract of land. Municipalities bordering the stream protested, alleging that, this would interfere with stream flow under flood conditions, cause a dangerous impoundment, and conflict with municipal plans. The Water Policy and Supply Division denied the application, concluding that the granting of the permit would be contrary to public interest, and that the construction would create a flood hazard. The court affirmed the agency's decision, holding that there was sufficient evidence to support the finding that the proposed structure was inimical to life and property of others, and that the agency's determination was not an unreasonable or arbitrary exercise of its regulatory power, but was in furtherance of its police power to promote public safety. (Wheeler-Fla) W69-06189

PASSAIC VALLEY WATER COMM'N V DEPARTMENT OF CONSERVATION (STATUTORY INTERPRETATION OF EXCESS DIVERSION ASSESSMENT FORMULA).

55 A 2d 225-227 (NJ 1947).

Descriptors: *New Jersey, *Administrative agencies, *Legislation, *Water allocation (Policy), Water supply, Municipal water, Water control, Water management (Applied), Watershed management, Judicial decisions, Legal aspects, Withdrawal, Diversion, Water utilization, Rivers, Streams, Streamflow.

The State Department of Conservation denied a request of a local water supply and distribution commission for reduction of charges for excess water diversion from a river watershed during a particular year. The only issue before the court was the proper judicial construction of the applicable state statute in order to determine the lawful formula on which the state agency could base its assessment. The court ruled that the assessment was erroneous, even though the contested formula had been adopted in charges made to other diverters over a period of years. The court said the legislature intended to increase the assessment for excess diversion proportionally as the stream flow was decreased by reason of the diversion. By the express wording of the statute, the assessment was to be based on the average daily flow for the driest month as shown by existing records or, if no records exist, then on a fixed formula. The assessment was set aside, and the agency ordered to compute its assessment on the basis of the flow of the driest month, since records were available. (Wheeler-Fla) W69-06190

GROBERT V PASSAIC VALLEY WATER COMM'N (RIGHT TO DIVERT RIVER WATER - AMOUNT).

61 A 2d 166-167 (NJ 1948).

Descriptors: *New Jersey, *Administrative agencies, *Water management (Applied), *Water utilization, Withdrawal, Water supply, Relative rights, Judicial decisions, Diversion, Streamflow, Easements, Legal aspects, Average flow, Average, Prior appropriation, Grants. Identifiers: Peak diversion.

The Court of Errors and Appeals remanded the case of Grobart v Passaic Valley Water Commission, 134 N J L 325, 47 A 2d 600, to the Supreme Court to take proofs and determine whether the Passaic Valley Water Commission, the appellant, had the derivative right to divert 75,000,000 gallons of water daily from the Passaic River. On remand, it was established that appellant acquired easements and rights from six separate grantors to divert a total of 75,000,000 gallons daily. The court noted, however, that the quantity of water which appellant had a vested right to divert was expressly limited by terms of the various grants to its predecessors in title to such quantities as may be

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necessary for certain specified uses. Proofs showed the peak of the average daily diversion to meet these specified uses was only 71,622,000 gallons, and the court stated this figure was the maximum right of diversion established by prior use. The court held that appellant had the right to divert not more than 71,622,000 gallons daily, and that consent from other organizations did not establish any right beyond the maximum amount established by prior use. (Wheeler-Fla)
W69-06191

CARR V UNITED STATES (DAMAGES TO OYSTER BED DUE TO DRAGGING OPERATIONS).

136 F Supp 527-538 (E D Va 1955).

Descriptors: *United States, *Oysters, *Commercial shellfish, *Dredging, Virginia, Judicial decisions, Damages, Legal aspects, Navigation, Federal jurisdiction, Federal government, Admiralty, Aircraft, Boats, Ships.
Identifiers: Dragging operation, Negligence, Governmental immunity.

Libellant sought to recover for damages to oyster beds. He alleged that the beds were negligently destroyed by dragging operations of the government in recovering wreckage of an Air Force plane. Evidence was introduced before the court sitting in admiralty that the dragging was more extensive than necessary, that the command of the salvage ship had notice of the beds, and that no efforts were made to protect libellant's property interest. The court, in awarding recovery, held that the government failed to exercise its duty of reasonable care to avoid damage. The court ruled that performance of an act deemed to be a necessary governmental function afforded no immunity under the Public Vessels Act, and that the paramount right of navigation was not intended to cover operations of this nature. Damages were awarded on the basis of calculated crop loss not entirely speculative. (Wheeler-Fla)
W69-06192

HARGADINE V SHARKEY (DIVERSION OF WATER FROM ITS NATURAL COURSES).

8 Ill App 2d 209, 131 NE 2d 134-143 (1956).

Descriptors: *Illinois, *Natural flow doctrine, *Surface drainage, *Ditches, Flood damage, Highways, Road banks, Flooding, Overflow, Diversions, Alteration of flow, Obstruction to flow, Drainage water, Rainfall, Surface waters, Surface runoff, Channels, Levees, Dam failure, Judicial decisions, Legal aspects.
Identifiers: Sovereign immunity.

Plaintiff brought an action to recover for damages to his farm land. He based his cause of action on two alleged acts of negligence by the defendant. The first allegation of negligence was that the defendant, while altering and improving a road adjacent to the plaintiff's property, destroyed the roadside ditches. This destruction diverted drainage water from its natural channel and caused it to flow onto plaintiff's land. The second allegation was that the defendant allowed a log farm to back up the river, causing a creek flowing into the river to wash out a levee and flow onto plaintiff's land. The court held that the first allegation stated a good cause of action, but ruled that the second allegation was insufficient. Defendant had no right to divert water from its natural course and discharge it upon the plaintiff's farm land. However, with regard to the second allegation, the court held that a county cannot be sued in tort. The plaintiff's action sounded in tort, and, therefore, the county was not liable for the resulting flood damage. (Stewart-Fla)
W69-06193

DANNER V UNITED STATES (FEDERAL GOVERNMENT'S LIABILITY FOR FLOOD

DAMAGES).

114 F Supp 477-480 (W D Mo 1953).

Descriptors: *Federal government, *Flood damage, *Missouri, *Landfills, Floods, Remedies, Discharge (Water), Missouri River, Flood plains, Watercourses (Legal), Judicial decisions, Legal aspects, Construction, Bridge construction, Bridges, Legislation, Damages, Natural streams, Rivers.

Identifiers: *Absolute liability, *Negligence, Federal Tort Claims Act, Corps of Engineers.

Defendant constructed a bridge with an approach fill extending 900 feet from the bridge in a certain area along the Missouri River. This fill was to serve as a form of embankment or barrier against flood water and was laid directly across the flood plain and natural channel of the river. During a flood, water was impounded behind the approach fill, causing it to collapse and resulting in a substantial discharge of water on plaintiff's property. Plaintiff brought suit for damages, basing his cause of action on absolute liability or, in the alternative, on negligence. The court denied relief. Under the Federal Tort Claims Act, the government cannot be held liable unless fault is shown. An agent of the government is liable for a negligent act only if a private person would be liable for such act under the law of the place where the act occurred. Federal law provides that when an agent is performing an act in connection with a discretionary function of government, no liability may be predicated on the negligent performance thereof. The court held that the construction of the approach fill was such a discretionary function. It furthermore noted that another statute expressly precluded governmental liability for damages caused by floods at any place. (Holt-Fla)
W69-06194

PEERLESS SERUM CO V UNITED STATES (LIABILITY FOR FLOOD DAMAGES).

114 F Supp 662-663 (W D Mo 1953).

Descriptors: *Missouri, *United States, *Flood control, *Flood damage, Flood forecasting, Historic flood, Warning systems, Rivers, Mississippi River, River forecasting, Floods, Watersheds, Water control, Water utilization, Navigation, Legislation, Judicial decisions, Legal aspects, Federal government.
Identifiers: Sovereign immunity.

The plaintiff brought this action to recover for damage caused by the Kaw River Flood of 1951. The government moved for a judgment on the pleadings. The plaintiff contended that it was the duty of the government to warn the public of the ensuing flood. The Flood Control Act specifically exempts the United States from liability for damage caused by floods, and this act was applicable in this case to relieve the government of any liability. The plaintiff claimed, however, that the act was limited to the lower Mississippi River projects. This contention was rejected by the court. Congress exempted itself from liability in connection with navigation and navigable waters of the United States. The government's motion for judgment on the pleadings was granted. (Shevin-Fla)
W69-06195

ARCHER V J S COMPTON, INC (INTERFERENCE WITH NATURAL FLOW).

30 NW 2d 92-97 (Iowa 1947).

Descriptors: *Iowa, *Diversion, *Alteration of flow, *Natural flow, Judicial decisions, Ditches, Drainage, Dikes, Embankments, Riparian rights, Repulsion (Legal aspects), Surface water, Surface runoff, Artificial watercourses, Natural use, Stream flow, Floods, Legal aspects, Riddance (Legal aspects), Overland flow.

Plaintiff sought a mandatory injunction against defendant, an adjacent landowner, for the removal of a dike formed by defendant's alteration of a natural ditch between their lands. Plaintiffs further sought damages for the diversion of surface water onto their land in an unnatural manner and quantity by such dike. The trial court found for plaintiffs, and defendant appealed. The supreme court affirmed, holding that a riparian owner cannot lawfully embank against the natural flow of a stream where such embankment would cause an increased volume of water to flow on the land of another to his injury. (Helwig-Fla)
W69-06196

HEPBURN V MADDOX (LIABILITY OF DRAINAGE DISTRICT).

340 Ill App 3d, 91 NE 2d 107-111 (Ct App 1950).

Descriptors: *Illinois, *Drainage districts, *Drainage engineering, *Erosion, Judicial decision, Excess water (Soils), Surface drainage, Bridges, Streams, Drainage effects, Drainage, Drainage practices, Legal aspects, Channeling, Ditches, Outlets, Riddance (Legal aspects), Damages.

Identifiers: Lateral support doctrine, Dominant heritage.

Defendant drainage district sought to clean and enlarge a drainage outlet stream. District commissioners engaged an engineering firm to draw plans and hired an independent contractor to do the work on the stream. Due to high water and heavy rains, the contractor stopped work 300 feet downstream from highway bridge maintained by plaintiff. The erosion caused by the drainage improvements caused the bridge to collapse. Plaintiff sought a writ of mandamus to have defendant restore bridge. The court held that a drainage district is not liable for the negligence of an independent contractor except where it was negligent in the selection of such contractor, or where it knew of or should have known of defects in plans used by such contractor. Here, though skillful engineers were employed, defendant knew or by the exercise of ordinary care should have known of the defects in the plans and specifications which caused the injury. Verdict for plaintiff was proper. (Helwig-Fla)
W69-06197

UNITED STATES V SHAPIRO (RIGHT TO REPEL SURFACE WATER).

202 F 2d 459-461 (DC Cir 1953).

Descriptors: *District of Columbia, *Surface water, *Repulsion (Legal aspects), *Reasonable use, Legal aspects, Judicial decisions, Surface runoff, Ditches, Channels, Construction, Grading, Cities, United States, Remedies, Alteration of flow, Riparian rights, Natural streams, Diversion, Riddance (Legal aspects), Damages.

The United States claimed that its zoo had suffered damages as a result of surface water directed onto it from defendant's adjacent property. The two adjacent tracts were located in a metropolitan area. Defendant, by certain grading operations, caused surface water to flow in a different direction than it had previously flowed. The court held that defendant was within his rights to direct surface water in the direction of the zoo. The common enemy rule is in effect in this jurisdiction. This rule provides that surface water may be repelled or directed onto the land of other proprietors if the flow of such water is the result of an ordinary use of the land and is not the result of channels, ditches or other extraordinary diversion structures. The court further held that grading of city land was an 'ordinary use' of such land if not done in a negligent or unusual manner. (Holt-Fla)
W69-06198

RATCLIFFE V INDIAN HILL ACRES (RIGHTS TO DISPOSE OF SURFACE RUNOFF WATERS).

113 NE 2d 30-35 (Ohio Ct App 1952).

Descriptors: *Ohio, *Surface runoff, *Reasonable use, *Riddance (Legal aspects), Surface waters, Ponds, Dams, Mud, Mudflows, Seeds, Water law, Judicial decisions, Damages, Streams, Natural flow, Obstruction to flow, Legal aspects, Riparian rights, Relative rights, Water pollution, Water pollution sources, Grading.

Identifiers: Direct causation.

Plaintiff, owner of the servient estate on a natural stream, constructed a dam across the stream which caused the formation of a pond on his property. Defendant, owner of the dominant estate, graded his property, causing additional mud and seed to flow into the stream. The grading did not alter the natural drainage of surface water into the stream. Plaintiff sought damages, alleging that the defendant had caused mud, seeds, and impurities to be deposited in his pond. The court denied relief, holding that, as a right of ownership, one may dispose of surface water in accordance with the natural contour of the watershed and, absent unreasonable or negligent actions, the servient owner has no right of recovery. Furthermore, the court said that one could use his property for any purpose which is reasonable, and, in this case, use of the property by the defendant was reasonable. Finally, the court said that plaintiff, by constructing a dam, had retarded the flow of water, thus causing the impurities to be retained in his pond. The plaintiff could not complain of damage caused by his own actions. (Holt-Fla)

W69-06199

UNITED STATES V STATE OF LOUISIANA, TEXAS, MISSISSIPPI, ALABAMA, AND FLORIDA (INTERPRETATION OF SUBMERGED LANDS ACT).

363 US 1, 121; 80 S Ct 961-1037 (1960).

Descriptors: *Federal-state water conflicts, *Boundaries (Property), *Submerged lands act, *Ownership of beds, Texas, Florida, Alabama, Louisiana, Mississippi, State government, Legislation, International Bound and Water Comm'n, United States, Mineralogy, Oil, Natural gas, Oil fields, Natural resources, Exploitation, Public rights, International Waters, Continental shelf, Tidal waters, Public benefits, Public lands.

Identifiers: Off-shore priority (State), Off-shore priority (Federal).

The United States sought a declaration that the federal government was entitled to exclusive possession of, and full dominion and power over the land, minerals, and other things underlying the waters of the Gulf of Mexico more than three geographic miles seaward from the Coast of Texas, Florida, Louisiana, Alabama, and Mississippi and extending to the Continental Shelf. The Supreme Court held that under the Submerged Lands Act the states seeking to assert a boundary in excess of the three-mile limits must demonstrate the existence of such an historical boundary prior to or at the time of admission of that state to the Union. Texas and Florida were found to have been admitted to the Union with a stipulation to a three marine league limit seaward into the Gulf. The states of Alabama, Mississippi and Louisiana were found to have entered the Union without provision for any kind of seaward boundary. Accordingly, the Court refused to recognize the claims of Louisiana, Mississippi and Alabama beyond the three-mile limit. The Court recognized that the three league coastal boundary of Texas and Florida pertained only in regard to domestic matters and did not have the effect of extending the United States continental waters into previously recognized International Waters. (Katz-Fla)

W69-06200

BENEFITS FROM INTEGRATED WATER MANAGEMENT IN URBAN AREAS - THE CASE OF THE NEW YORK METROPOLITAN REGION.

Columbia Univ., New York; Barnard Coll., New York. Dept. of Geography; and Rutgers - The State Univ., New Brunswick, N. J.

For primary bibliographic entry see Field 06B. W69-06201

RESERVOIRS: PROBLEMS AND CONFLICTS.

For primary bibliographic entry see Field 06B. W69-06207

THE LAW OF WATER IN NEW JERSEY.

Rutgers - The State Univ., New Brunswick, N. J. School of Law.

Eva M. Hanks.

Rutgers L Rev, Vol 22, No 4, Part I, pp 621-715, Summer 1968. 96 p. 483 ref.

Descriptors: *New Jersey, *Water law, *Riparian rights, *Surface waters, Judicial decisions, Legal aspects, Water users, Natural flow doctrine, Reasonable use, Prior appropriation, Water pollution, Repulsion (Legal aspects), Riddance (Legal aspects).

The riparian system of water allocation, commonly employed in the eastern states, is distinguished from the prior appropriation system, followed by the majority of western states. A brief comparison is made of riparian rights in watercourses under the English rule of natural flow and the American rule of reasonable use, and the author relates how each rule operates to achieve the peculiar goals of its native water law system. The historical development of New Jersey law in regard to riparian use of surface watercourses and the right to equitable relief, and the factors considered by the court in granting such relief, are considered. After an analysis of court decisions, an attempt is made to classify New Jersey as a jurisdiction following either the natural flow rule or the reasonable use rule in litigation including the use and pollution of watercourses. Further analysis is made of New Jersey cases involving diffused surface water drainage controversies, and New Jersey's usage of the civil law and common enemy rules is considered. (Molica-Fla)

W69-06301

THE LAW OF WATER IN NEW JERSEY.

Rutgers - The State Univ., New Brunswick, N. J. School of Law.

Eva M. Hanks.

Rutgers L Rev, Vol 22, No 4, Part I, pp 621-636, Summer 1968. 16 p.

Descriptors: *New Jersey, *Riparian rights, *Surface waters, *Natural flow doctrine, Judicial decisions, Water law, Legal aspects, Riparian land, Reasonable use, Prior appropriation, Water pollution, Water resources development, Water utilization, Conjunctive use, Non-consumptive use.

New Jersey is a riparian state and, thus, the right to use water is based upon ownership of land contiguous to the particular body of water. There are two distinct theories regarding the exercise of riparian rights. These theories are embodied in: (1) the English rule of natural flow; and (2) the American rule of reasonable use. Unlike the American rule, the English rule prohibits the use of water for nonriparian land or for purposes unconnected with the riparian land and permits a riparian owner to maintain an action without proof of actual damages. The American rule encourages the maximum development of water resources. Both rules seem to offer the same degree of protection to private investment in water resource development. (Molica-Fla)

W69-06302

THE LAW OF WATER IN NEW JERSEY.

Rutgers - The State Univ., New Brunswick, N. J. School of Law.

Eva M. Hanks.

Rutgers L Rev, Vol 22, No 4, Part I, pp 636-687, Summer 1968. 52 p.

Descriptors: *New Jersey, *Natural flow, *Reasonable use, *Consumptive use, Judicial decisions, Water law, Legal aspects, Riparian rights, Surface waters, Natural flow doctrine, Non-consumptive use, Water pollution, Water utilization, Remedies, Water pollution control, Administrative agencies.

New Jersey court decisions show that consumptive water use for riparian land is governed by the English rule of natural flow. However, the results reached by the courts are the same as would be reached in reasonable use jurisdictions. Consumptive use of water on nonriparian land is controlled by the natural flow theory, and the courts will prohibit such use when another riparian owner's water supply is diminished. Nonconsumptive water use is allowed to the extent that the natural flow of a stream is not thereby diminished. Unlike the English procedure, in New Jersey a claimant may seek equitable relief without first establishing his right to relief at law; however, the courts will balance the conveniences of the parties before granting equitable relief. New Jersey has expressly adopted the rule of reasonable use in regard to surface watercourse pollution controversies. Private litigation has failed to deal with pollution control adequately. The enforcement flexibility of administrative agencies makes them an appropriate mechanism for use in this area marked with legal battles. (Molica-Fla)

THE LAW OF WATER IN NEW JERSEY.

Rutgers - The State Univ., New Brunswick, N. J. School of Law.

Eva M. Hanks.

Rutgers L Rev, Vol 22, No 4, Part I, pp 687-715, Summer 1968. 29 p.

Descriptors: *New Jersey, *Surface waters, *Surface runoff, *Reasonable use, Judicial decisions, Water law, Legal aspects, Riparian rights, Surface drainage, Water pollution, Natural flow, Remedies, Alteration of flow, Repulsion (Legal aspects), Riddance (Legal aspects).

Controversies as to the disposition of diffused surface waters have been traditionally decided by the 'civil law' rule or the 'common enemy' rule, depending upon the jurisdiction. Under the civil law rule, a servient landowner may not impede the natural course of drainage water across his land. Most courts have liberalized this rule by applying a 'rule of reason' which allows a consideration of all relevant factors in determining the propriety of contemplated obstruction or diversion of the natural flow. In its strict form, the common enemy rule allows one to protect his land from drainage water without regard to other servient or dominant estates. An examination of the consequences of each rule indicates that, in general, neither can be said to hinder or further the development of land. Recently, courts have supplanted the two rules by the 'reasonable use' doctrine which reflects a 'tort law' approach to the problem rather than the inflexible 'property law' approach previously used for determining riparian rights to surface watercourses. An examination of New Jersey case law reveals that the common enemy rule has been expressly replaced by the reasonable use doctrine. However, the extent to which tort law is applicable in drainage controversies is unsettled. (Molica-Fla)

W69-06304

WASTES, WATER, AND WISHFUL THINKING: THE BATTLE OF LAKE ERIE.

Case Western Reserve Univ., Cleveland.

For primary bibliographic entry see Field 05G.

W69-06305

Field 06—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

AN EXPLORATION OF COMPONENTS AFFECTING AND LIMITING POLICY MAKING OPTIONS IN LOCAL WATER AGENCIES,
Colorado State Univ., Fort Collins. Dept. of Political Science.
For primary bibliographic entry see Field 06B.
W69-06306

TAYLOR V TAMPA COAL CO (RIPARIAN RIGHTS IN NON-NAVIGABLE LAKE).

46 So 2d 392-394 (Fla 1950).

Descriptors: *Florida, *Irrigation effects, *Non-navigable waters, *Relative rights, Farm ponds, Drawdown, Riparian waters, Skimming, Diversion, Withdrawal, Artificial use, Citrus fruits, Riparian rights, Dry seasons, Border irrigation, Rainfall disposition, Seepage, Boating, Fishing, Recreation, Judicial decisions, Legal aspects.
Identifiers: Injunctions (Mandatory).

Plaintiff brought suit to enjoin defendant from pumping water from a non-navigable lake to irrigate defendant's citrus grove. The lake was situated on four adjoining tracts of land owned separately by different persons including plaintiff and defendant. The lake water came wholly from rainfall and seepage. Under Florida law, each riparian owner had the right to use the water in the lake for all lawful purposes, so long as his use was not detrimental to the rights of the other riparian owners. Plaintiff's use of lands bordering on the lake was reasonable, and he was entitled to seek relief for unlawful interference with the lake's natural condition. The lake, owing its supply solely to rainfall and seepage, was too small, when at normal level, to allow water to be pumped for irrigation purposes without consequent damage to plaintiff's rights. Therefore, defendant was enjoined from taking water for irrigation during the dry season when the lake was either at or below normal level. (Reed-Fla)
W69-06307

HOWLETT V CITY OF SOUTH NORFOLK (FLOOD DAMAGE ALLEGEDLY DUE TO STREET ELEVATION).

For primary bibliographic entry see Field 04C.
W69-06308

PHILLIPS V CHESSON (DIVERSION CAUSED BY EXCAVATED SLOPE).

For primary bibliographic entry see Field 04A.
W69-06309

MESSANA V MAULE INDUSTRIES (NEGLIGENT FLOODING OF FARM LAND).

For primary bibliographic entry see Field 04A.
W69-06310

DAVENPORT V TOWN OF DANVERS (FLOODING OF LAND BY CITY DAM).

For primary bibliographic entry see Field 04A.
W69-06311

H W PEERSON DRILLING CO V SCOGGINS (DEED EXCEPTIONS AND RIGHTS TO SUBTERRANEAN WATERS).

74 So 2d 450-451 (Ala 1954).

Descriptors: *Alabama, *Water wells, *Water pollution, *Diversion, Mineralogy, Drilling, Subsurface waters, Mine wastes, Water quality, Underground reservoirs, Water storage, Natural resources, Shafts, Damages, Percolating water, Water supply, Water rights, Relative rights.
Identifiers: *Surface owner, Deeds.

Plaintiff surface owner brought action for damages caused by diversion or pollution of water from his well. The minerals and mining rights beneath the

surface of the land were excepted in plaintiff's deed. The court held that while it may be conceded that water, in a technical sense, is a mineral, the words 'minerals and mining rights', as used in the conveyance under consideration, should be given the meaning accorded them by common usage. When so viewed, the exception of minerals and mining rights from the conveyance did not deprive plaintiffs of rights to the subterranean waters beneath the surface of their land. (Reed-Fla)
W69-06312

MITCHELL V CITY OF ST PAUL (NEGLIGENT OPERATION OF PUBLIC RESERVOIR).

31 NW 2d 46-55 (Minn 1948).

Descriptors: *Minnesota, *Reservoir operation, *Pumped storage, *Reservoir storage, Water supply, Lakes, Hydraulic structures, Water levels, Surface drainage, Surface runoff, Surface waters, Storm runoff, Rainfall, Cloudbursts, Judicial decisions, Legal aspects, Damages.
Identifiers: Lake Vadnais.

This is an action by the appellant against the respondent city to recover for damages to his land by trespass of water. The trespass was alleged to be the result of improper control of water elevations by appellee in certain lakes used by the city as reservoirs. Appellant appeals from an order denying his motion for new trial after a verdict for the appellee. The court held that although the title of a riparian owner on navigable or public waters extends to the ordinary low water mark, his title is not absolute, except as to the ordinary high water mark. As to the intervening space, his rights are qualified by the right of the public to use the same for public purposes (such as water storage) and navigation. A riparian owner is entitled to recover damages for such overflow as may occur above the ordinary high water mark. Plaintiff below failed to prove overflow above the ordinary high water mark. The court noted that any damage caused to appellant's lands was caused by extraordinary and unprecedented rainfall, rather than negligence on the part of the appellees. (Katz-Fla)
W69-06313

ZIDEL V STATE (STATE LIABLE FOR EROSION CAUSED BY NEGLIGENTLY PLACED ROAD).

For primary bibliographic entry see Field 04C.
W69-06314

SOUTH DAKOTA - MINNESOTA BOUNDARY WATERS COMMISSION TRI-STATE WATERS COMMISSION.

Minn Stat Ann secs 114.01, 114.021, 114.09 (1967).

Descriptors: *Minnesota, *Interstate commissions, *Legislation, *Interstate compacts, South Dakota, North Dakota, Pollution abatement, Flow control, Flood control, Project planning, Artificial use, Eminent domain, Financing, Administrative agencies, Boundaries (Property), Watersheds (Basins), Watershed management.
Identifiers: Red River.

The South Dakota-Minnesota Boundary Waters Commission, and interstate commission, consisting of the South Dakota Game and Fish Commission director, the Minnesota Commissioner of Conservation, and an engineer appointed by mutual consent of the governors, is created. The Commission is empowered to determine and prescribe plans for controlling the level of those boundary waters capable of artificial regulation. Minnesota, by creating a tri-state waters area and commission, agrees with North and South Dakota to cooperate in flood and pollution control in the advantageous usage of the Red River of the North drainage basin. The Commission shall: (1) study water problems in the area; (2) approve all plans for public and

private works on boundary waters; (3) maintain the level and flow of waters, except in the Otter Tail River; (4) cooperate with federal and state agencies in water projects; (5) exercise eminent domain and all other powers not inconsistent with the federal and state constitutions; and (6) recommend to the respective legislatures of the signatory states methods to finance its work. There shall be a proportionate sharing of expenses by the two states. (Harris-Fla)
W69-06315

MUNICIPAL WATER POLLUTION CONTROL.

For primary bibliographic entry see Field 05G.
W69-06316

STATE WATER SUPPLY DEVELOPMENT.

For primary bibliographic entry see Field 03D.
W69-06317

LOUISVILLE SAND AND GRAVEL CO V RALSTON (THE 'THREAD OF THE STREAM' AS A BOUNDARY LINE).

266 SW 2d 119-122 (Ky 1954).

Descriptors: *Kentucky, *Ownership of beds, *Boundaries (Property), *Riparian rights, Land tenure, Legal aspects, Damages, Navigable waters, Channels, Low water mark, Shores, Judicial decisions, Leases, Beds, State governments, Ohio River, Dredging, Relative rights, Legislation, River beds, Thalweg.

Defendant company was authorized to remove sand and gravel from the Ohio River 'north of the thread of the stream' under a lease and state statute. The defendant dredged south of the geographical center of the river but north of the center line of the main channel; the center line was close to the south shore at that point. Plaintiffs, who owned land on the south shore, sued to recover damages for trespass to their land. On appeal, the court was faced with the necessity of determining the exact location of the dividing line between the property of the riparian owners and the property of the northern low water mark and the thread of the stream; the latter property was owned by the state. The court held the Kentucky State Boundary to be along the north bank of the Ohio River at the low water mark. Rights of riparians extend to the thread of the stream. The court held the thread to be midway between the low water marks on opposite shorelines, without regard to the main channel or deepest part of the river. The trial court's judgment for plaintiff was affirmed. (Harris-Fla)
W69-06318

RUSSELL V BROWN (TITLE TO LAND AFTER 'ACCRETIONS' AND 'AVULSION').

260 SW 2d 257-260 (Tenn 1953).

Descriptors: *Tennessee, *Avulsion, *Accretion (Legal aspects), Land tenure, Ownership of beds, Mississippi River, Riparian rights, Public rights, Easements, Judicial decisions, Legal aspects, Relative rights, Channels, Beds, Boundaries (Property).
Identifiers: Action to quiet title.

In a suit to quiet title, the chancery court sustained a demurral of the grantee of the land under a deed. Grantors sought to quiet title, claiming the land had not passed with the deed which purported to convey the land to grantee-defendant. The land in question consisted largely of accretions from the Mississippi River, which, after an avulsion, cut through the land from north to south. The grantors claimed that the land lying to the west of the river was not conveyed by the deed. In construing the deed purporting to convey title to the eastern land and the wester accretions, the supreme court defined 'dereliction' as a recession of waters by which land previously covered is left dry. If dereliction occurs gradually and imperceptibly, the dere-

lict land belongs to the riparian owner from whose shore the water receded. An avulsion, or sudden change in the channel of a stream, works no change of boundary. The court held that the grantor had title to the bed of the river subject to a public easement. Thus the east and west portions were 'contiguous' as conveyed by the deed. (Harris-Fla) W69-06319

PONELEIT V DUDAS (ZONING REGULATIONS AS AFFECTING RIPARIAN RIGHTS).

141 Conn 413, 106 A 2d 479-482 (1954).

Descriptors: *Connecticut, *Riparian rights, *Zoning, *Navigable waters, Land tenure, Legal aspects, Land reclamation, Cities, Water zoning, Public rights, Local governments, Judicial decisions, Usufructuary rights, Land use, Piers, Land classification, High water mark, Regulation, Harbors, Public benefits.

Identifiers: *Injunctions (Prohibitor), *Constitutional law, Due process.

Defendants owned land bordering on a navigable harbor. They constructed a pier and began operating a boat livery business. City zoning regulations prohibited business in that zone. The regulations further provided that waters within the city limits took on the zoning classification of adjacent land. Plaintiff building inspector brought action for an injunction to restrain defendants from violating the zoning regulations. The court of common pleas held for plaintiff. On appeal, the supreme court of errors affirmed holding that riparian rights, as well as other property rights, could be limited by zoning regulations regardless of whether such regulations were being used to promote the use of navigable waters. Such regulations are constitutional, as long as reasonably related to the public welfare, even if they involve a taking of property to a limited extent. The court further held defendants' reclaimed land was within the city limits and not immune from regulation. (Harris-Fla) W69-06320

ATCHLEY V TENNESSEE VALLEY AUTHORITY (FLOODING OF CROPS CAUSED BY RAISED RESERVOIR WATERS).

For primary bibliographic entry see Field 04A. W69-06321

CITY OF MERIDAN V SULLIVAN (SUBSURFACE DRAINAGE).

For primary bibliographic entry see Field 04A. W69-06322

BELUE V CITY OF GREENVILLE (DUTY OF CITY TO PROVIDE DRAINAGE OF THOROUGHFARES).

For primary bibliographic entry see Field 04A. W69-06323

HILL V CITY OF GREENVILLE (DAMAGES RESULTING FROM CITY'S FAILURE TO PROVIDE DRAINAGE).

For primary bibliographic entry see Field 04A. W69-06324

CRITES V UNITED STATES (CLAIMS FOR LOSS IN VALUE OF LAND DUE TO IRRIGATION PROJECT).

For primary bibliographic entry see Field 03F. W69-06325

NORTH COUNTIES HYDROELECTRIC CO V UNITED STATES (DAMAGES RESULTING FROM ICE JAM).

70 F Supp 900-903 (Ct Cl 1947).

Descriptors: *Illinois, *Streams, *Flooding, *Ice jams, Hydraulic structures, Dams, Ice, Slush, Hydroelectric plants, Ice breakup, Meanders, Navigable rivers, Locks, United States, Federal government, Judicial decisions, Legal aspects, Damages.

Plaintiff brought this action against the United States to recover damages for impairment of the value of its power plant. Such damage was allegedly caused by defendant's construction of a lock and dam downstream on the Illinois River. The power plant was constructed in 1927, and the dam was constructed in 1933. Ten years after the dam had been completed, an ice jam formed below the plaintiff's power plant. The accumulation of ice behind this jam was allegedly prevented from moving further downstream by defendant's dam. Ice backed up into plaintiff's power plant and the plant was closed for approximately one month because of the ice intrusion. The court held that plaintiff had failed to prove that the construction of the dam caused the backup. Plaintiff also contended that he should recover a prospective damage award since it was likely that such ice jams would recur periodically. The court noted that the damage actually suffered by plaintiff was not shown to be of a permanent nature and was not proved to have been caused by defendant. (Katz-Fla) W69-06326

STATE V SULLIVAN (REGULATION BY FRESH WATER FISH COMM'N).

30 So 2d 919-920 (Fla 1947).

Descriptors: *Florida, *Administrative agencies, *Fish conservation, *Regulation, Judicial decisions, Nonstructural alternatives, Legislation, Jurisdiction, Freshwater fish, Administrative decisions, Legal aspects, Saline water, Fresh water, Classification, State governments.

Identifiers: Constitutional law, Penalties (Criminal), Police power.

Defendant was arrested for violating a Florida Game and Fresh Water Fish Commission rule prohibiting the manner in which the defendant had taken, transported, and sold fresh water fish. The defendant alleged that he had taken the fish in good faith and in reliance upon the laws enacted by the state legislature which declared that the waters in which he was fishing were salt water and hence not subject to the Commission's rules. The defendant's writ of habeas corpus was discharged by the circuit court; this court affirmed. The Commission was empowered by the state constitution to impose reasonable rules regulating the conservation of fresh water fish. The rule declaring the waters in question as fresh was a reasonable rule, and it was not within the power of the legislature to pass a statute abrogating that rule. The legislature may pass laws in aid of the Commission's regulations, but it cannot contemplate laws which prescribe a method of taking fresh water fish which is different from that prescribed by the Commission. (Blunt-Fla) W69-06327

BECK V GAME AND FRESH WATER FISH COMM'N (JURISDICTION OF FRESH WATER FISH COMM'N).

33 So 2d 594-596 (Fla 1948).

Descriptors: *Florida, *Administrative agencies, *Nonstructural alternatives, *Jurisdiction, State governments, Judicial decisions, Water types, Fish conservation, Regulation, Saline water, Fresh water, Classification, Administrative decisions, Legislation, Legal aspects, Fresh water fish.

Identifiers: Constitutional law.

The Florida Fresh Water Fish Commission brought this action seeking to declare unconstitutional certain statutes which classified waters as 'salt water'. The Commission's rules regulating the taking of fresh water fish from the waters in question were

adopted in 1944; the legislative acts contrary to these rules were passed in 1947. The statutes, in effect, removed the waters from the jurisdiction of the Commission and placed them under the Board of Conservation. This court affirmed a lower decree declaring the subsequently enacted statutes unconstitutional. The constitutional provision which created the Commission vested it with exclusive powers to regulate the state's fresh water fishing industry and divested the Legislature of the power to control the taking of fresh water fish. Even if the waters in question had been classified as salt prior to the creation of the Commission, the constitutional amendment expressly provides that all existing laws inconsistent with the Commission's jurisdiction would be void. Therefore, it was unconstitutional for the Legislature to pass laws effectively ousting the Commission's jurisdiction over the waters in question. (Blunt-Fla) W69-06328

HAUGHTON V LANKFORD (CONSTITUTIONALITY OF CONSERVATION REGULATION).

189 Va 183, 52 SE 2d 111-122 (1949).

Descriptors: *Virginia, *Legislation, *Oysters, *Administrative agencies, Fish conservation, Wildlife conservation, Permits, State governments, Inland waterways, Tidal marshes, Tax rate, Beds, Shoals, Judicial decisions, Legal aspects, Ownership of beds, Administrative regulation.

Identifiers: *Constitutional law, Delegation doctrine.

Plaintiff brought this action for a declaratory judgment to determine the constitutionality of a statute prohibiting the removal of seed oysters from the waters of Virginia without a permit from the Commissioner of Fisheries. The Commissioner had determined that the seed oyster beds were greatly depleted and that the projected demand for seed oysters for the coming season would result in destruction of these beds if permits were issued. The plaintiff contended that the legislation enabling the Commissioner to withhold permits and thereby curtail the taking of oysters was unconstitutional in that it impaired the obligation of contracts held by the plaintiffs, unlawfully restrained interstate commerce, and deprived the plaintiff of property without due process of law. The court held that contracts of this type are always subject to the implied condition of continuing legality of the service contracted for and that the obligation was not impaired by the exercise of the state police power. The court struck down plaintiff's contention that the order illegally restrained interstate commerce, saying that the state has absolute ownership of beds under inland waters and absolute ownership of the oysters therein and can subject same to necessary regulation. (Katz-Fla) W69-06329

STATE V TOWN OF GOFFSTOWN (SUIT TO FORCE COMPLIANCE WITH ORDER TO ABATE RIVER POLLUTION).

For primary bibliographic entry see Field 05G. W69-06330

LEGAL ASPECTS OF NEW JERSEY POTABLE WATER PROGRAM.

For primary bibliographic entry see Field 05G. W69-06331

POWERS AND FUNCTIONS OF DEPARTMENT OF WATER RESOURCES - FLOOD CONTROL.

For primary bibliographic entry see Field 04A. W69-06332

CREATION OF DEPARTMENT OF WATER RESOURCES AND WATER RESOURCES

Field 06—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

COMM'N.

Md Ann Code Art 96A:1-5 (1957), as amended, (Supp 1968).

Descriptors: *Maryland, *Administrative agencies, *Water resources development, *Water policy, Legislation, Regulation, Water resources, Water quality control, Water conservation, State governments, Water pollution control, Planning, Future planning (Projected), Long-term planning, Short-term planning, Social function, Supervisory control (Power), Public health, Public benefits.

Maryland has created a State Department of Water Resources for purposes of water resources planning, development, and conservation. Powers and duties formerly exercised by the Water Pollution Control Commission and Department of Mines, Geology, and Water Resources are transferred to the Department of Water Resources. The state has also created a Water Resources Commission representing general fields of public health, industry, agriculture, municipalities, and natural resources. The Commission has the following powers and duties: (1) to act in an advisory capacity to the Director of the Department; (2) to keep informed of the Department's activities; (3) to consider further development needs from points of view of the several interests of the public; (4) to promulgate rules and regulations pursuant to statutory authority; (5) to approve programs of the Department; (6) to assist the Director in fostering public understanding, participation, and interest; and (7) to hold public hearings when necessary. (Wheeler-Fla)
W69-06333

AN ACT RELATING TO LAKES, PERMITTING THE CREATION OF LAKE CONSERVATION DISTRICT WITH CERTAIN POWERS.

Minn Sess Laws ch 907 (1967).

Descriptors: *Minnesota, *Lakes, *Water conservation, *Administrative agencies, Project purposes, Water resources development, Conservation, Legislation, Resources, Preservation, Cities, Regulation, Organizations, Water pollution control, Coordination, Budgeting, Water management (Applied), Pollution abatement, Local governments, Boating, Docks, Recreation, Marinas, Water control.

Identifiers: Conservation districts.

If, after holding public hearings, the governing bodies of two-thirds of the municipalities bordering on Lake Minnetonka determine that a lake conservation district shall be established, all the municipalities bordering the lake shall establish such a lake conservation district. The district shall be governed by a board composed of members elected by the governing bodies of each municipality and shall have the power to regulate boating, public facilities, lake use, docks, de-icing, and commercial marinas. The district shall also be empowered to contract with other law enforcement agencies to police the lake and its shore, to contract with other governmental bodies to perform district functions, to undertake lake research and report to water pollution authorities, to develop a pollution abatement program, to receive financial assistance from and join in projects of other agencies for pollution abatement, and to construct and operate water control structures. Duties and procedural guidelines of the district are established by the state. (Wheeler-Fla)
W69-06334

AN ACT ESTABLISHING AN INTERIM COMM'N TO STUDY THE PROBLEM OF WATER POLLUTION AND APPROPRIATING MONEY THEREFORE.

For primary bibliographic entry see Field 05G.
W69-06335

WATERWORKS, MAIN SEWERS, SEWAGE DISPOSAL PLANTS.

For primary bibliographic entry see Field 05G.
W69-06336

SEWAGE DISPOSAL: WATER AND SEWAGE.

For primary bibliographic entry see Field 05G.
W69-06337

STATE FORESTS; TREE PLANNING.

For primary bibliographic entry see Field 03F.
W69-06338

FISH.

For primary bibliographic entry see Field 05G.
W69-06339

IRRIGATION.

For primary bibliographic entry see Field 03F.
W69-06340

IMPROVEMENT AND MODERNIZATION OF N. Y. WATER LAW WITHIN THE FRAMEWORK OF THE RIPARIAN SYSTEM.

Cornell Univ., Ithaca, N. Y.

William H. Farnham.

Cornell Univ Water Resources Center, Feb 1968.
56 p, 194 ref. OWRR Project B-003-NY.

Descriptors: *New York, *Water law, *Riparian rights, *Reasonable use, Legislation, Judicial decisions, Planning, Consumptive use, Water rights, Reservoirs, State governments, Water resources development, Legal aspects, Natural flow doctrine, Natural use, Prescriptive rights, Diversion, Prior appropriation, Riparian land, Riparian water, Domestic water, Severance.

Identifiers: Police powers, Constitutionality.

It is submitted that the elimination of uncertainties in New York water law in order to encourage the development of the state's water resources, and the preparation for governmental projects by clarifying the extent of private water rights, could be effectively expedited through legislation which would fit naturally into the existing riparian doctrine framework. The proposed legislation would: (1) protect the investor in riparian land by preserving unused and used riparian rights; (2) encourage dam and reservoir construction by allowing lower riparian owners to share in the increased water supply only on equitable terms; (3) define domestic use and riparian land; (4) legalize harmful uses when reasonable under all the circumstances and authorize consideration of the public interest when determining reasonableness; (5) facilitate alteration in water use in response to changing conditions by making it clear that riparian rights are transferable and by retaining the riparian principle of variability; (6) achieve a balance between certainty and flexibility by permitting a guarantee that the use declared reasonable may be continued for a specified time; and (7) relax to a reasonable degree the restrictions on non-riparian uses. (Childs-Fla)
W69-06341

SEWAGE DISPOSAL PLANTS.

Mich Comp Laws Ann secs 123.201-123.220 (1967).

Descriptors: *Michigan, *Legislation, *Sewage disposal, *Local governments, Sewage, Municipal wastes, Sanitary engineering, Sewage treatment, Waste water disposal, Cities, Financing, Costs, Treatment facilities, Utilities, Construction, Use rates, Condemnation, Waste disposal, Sewers, Legal aspects.

Identifiers: *Sewage disposal plants.

Every city is authorized to construct, operate, and maintain sewage disposal works and the necessary connecting systems. Cities may acquire property

and issue revenue bonds to finance such works. Before construction may begin, a city shall adopt an ordinance setting forth the description, cost, useful life, and other data concerning the facility. The ordinance shall be approved by 3/5 of the electors. Control of the works shall be the responsibility of the city legislative body. Any city is empowered to enter into all contracts necessary to carry out the provisions of this act. This act shall constitute full authority to finance, construct, and operate sewage disposal works. (Helwig-Fla)
W69-06342

SEWERS IN PRIVATE PROPERTY: ACQUISITION OF PROPERTY RIGHTS.

Mich Comp Laws Ann sec 123.181 (1967).

Descriptors: *Legislation, *Sewers, *Sanitary engineering, *Michigan, Sewage, Cities, Legal aspects, Eminent domain, Municipal wastes, Sewage disposal, Local governments, Real property, Condemnation, Operation and maintenance.

The common council of any city and the board of trustees of any village are authorized to construct and maintain sewers on private property; their representatives may enter upon private property and make examinations and surveys to enable them to determine the necessity for using the private property for a sewer. No action is maintainable to present or to recover damages for such an entry. Before constructing a sewer on private property, the right to take and use such property shall be acquired by agreement or purchase, or in the manner provided by law. (Dean-Fla)
W69-06343

OHIO RIVER VALLEY WATER SANITATION COMPACT.

For primary bibliographic entry see Field 05G.
W69-06344

SOUTHLAND CO V AARON (ACTION FOR POLLUTION OF DOWNSTREAM WATER SUPPLY).

For primary bibliographic entry see Field 05G.
W69-06345

CHAPMAN V FEDERAL POWER COMM'N (PRIVATE CONSTRUCTION OF HYDROELECTRIC PLANT AND RIVER BASIN PROJECT).

For primary bibliographic entry see Field 08C.
W69-06346

DELAWARE RIVER BASIN.

N J Stat Ann secs 58:18-18 to 58:18-23 (1966).

Descriptors: *New Jersey, *Delaware River Basin Commission, *River basin commissions, *Project feasibility, New York, Pennsylvania, Interstate rivers, Delaware River, Project purposes, River basins, Project planning, Water supply, Reservoir construction, Reservoir sites, Dam construction, Dam sites, State governments, Administrative agencies, Costs, Legislation, River basin development.

The Interstate Commission of the Delaware River Basin is designated as the State Agency of New Jersey to cooperate with New York and Pennsylvania in making a study to determine the advisability of implementing an integrated water project within the Delaware River Basin. The project, comprised of dams and reservoirs, would be designed to meet the prospective water supply needs of New Jersey, New York, and Pennsylvania. The Commission shall require any person, firm, or corporation engaged by it to enter into a written agreement which will require such person, firm or corporation to pay all damages arising from the work to be performed for the Commission. The members of the Commission and its agents, engineers, or contractors may enter upon any lands, structures, or waters within

the state to survey proposed dam or reservoir locations. The Commission is to file a full report of its findings, conclusions, and recommendations to the Governors and Legislatures of New Jersey, New York and Pennsylvania. (Stewart-Fla.)
W69-06347

INLAND WATERWAYS.
NJ Stat Ann secs 12:6-1 to 12:6-20 (1968).

Descriptors: *New Jersey, *Legislation, *Inland waterways, *Canals, Administrative agencies, Channels, Harbors, Inlets (Waterways), Rivers, Transportation, Administration, Navigation, Riparian lands, State governments, Water law, Tributaries, Regulation.
Identifiers: *Harbor masters, Navigation aids.

This statute deals with the administration and control of the inland waterways within the state. The powers and duties of the Board of Commerce and Navigation in regard to inland waterways are: (1) to investigate and make annual reports to the governor concerning the condition of the waterways, recommending any improvement or additional construction deemed appropriate; (2) to maintain existing waterways and construct new ones as authorized; (3) to make and enforce waterway rules; (4) to maintain navigation aids on the waterways; and (5) to appoint harbor masters as needed. The duties of the harbor masters are: (1) to supervise the maintenance and use of the waterways; (2) to act as special officers for the enforcement of the laws of the state and rules of the Board; and (3) to regulate traffic upon the waterways. The Board of Commerce and Navigation may improve any tributaries to the inland waterway as it deems advisable. Any tributary so improved shall become part of the waterway system. The Board may apply for federal aid to improve tributaries with state moneys. The Commissioner of Conservation and Economic Development is authorized to convey the title of the state in the New Jersey Intracoastal Waterway to the United States. (Helwig-Fla.)
W69-06348

POLLUTION OF FRESH WATERS.
For primary bibliographic entry see Field 05G.
W69-06349

POLLUTION OF POTABLE WATERS.
For primary bibliographic entry see Field 05G.
W69-06350

PROTECTION AND IMPROVEMENT OF WATERS.
For primary bibliographic entry see Field 05G.
W69-06351

ORGANIZATION AND GENERAL PROVISIONS.
For primary bibliographic entry see Field 05G.
W69-06352

POLLUTION CONTROL.
For primary bibliographic entry see Field 05G.
W69-06353

ENFORCEMENT.
For primary bibliographic entry see Field 05G.
W69-06354

BRIGGS V CITY OF VIROQUA (SEWAGE DISCHARGE ACROSS LAND).
For primary bibliographic entry see Field 05C.
W69-06355

VEAZEY V CITY OF DURHAM (PERMANENT DAMAGES RESULTING FROM MUNICIPAL SEWAGE DISCHARGE).
For primary bibliographic entry see Field 05C.

W69-06356

GOULD AND EBERHARDT, INC V CITY OF NEWARK (DISCHARGE OF SURFACE WATERS FROM STORM SEWER).
For primary bibliographic entry see Field 04A.
W69-06357

STATE V BOSTIAN (EMINENT DOMAIN AND MUNICIPAL WATER SUPPLY).

272 SW 2d 857-863 (Mo Ct App 1954).

Descriptors: *Missouri, *Eminent domain, *Public utilities, *Water supply, Underground streams, Subsurface waters, Streams, Running waters, Condemnation, Underflow, State governments, Non-navigable waters, Water rights, Legislation, Judicial decisions, Municipal water, Cities, Local governments, Legal aspects, Appropriation.

Plaintiff brought condemnation proceedings against defendant's property for the purpose of taking water from certain underground streams. The streams were to be used for municipal water supply. Plaintiff based its suit on a statute which authorized a municipal water supplier to take water from any 'non-navigable stream.' Defendant contended that the reference to 'non-navigable streams' contemplates surface streams, not underground streams. Furthermore, defendant contended that since the right of eminent domain comes from the Legislature and constitutes an invasion of private property, a statute granting such right should be strictly construed. The statute did not authorize plaintiff to appropriate private lands in order to obtain a source of underground water. The court agreed that the right of eminent domain should be strictly construed and that any doubt should be resolved in favor of the taxpayer. The trial court's judgment for the defendant was affirmed. (Stewart-Fla.)
W69-06358

WOODWARD IRON CO V MUMPOWER (DAMAGE TO SURFACE OWNERS RIGHTS FROM MINING OPERATIONS).
For primary bibliographic entry see Field 04A.
W69-06359

STIGALL V SHARKEY COUNTY (DESTRUCTION OF DRAINAGE FACILITIES CAUSING FLOOD DAMAGE).
For primary bibliographic entry see Field 04A.
W69-06360

HALL V CITY OF GREENVILLE (STATUTORY DUTY OF CITY TO PROVIDE ADEQUATE STREET DRAINAGE).
For primary bibliographic entry see Field 04A.
W69-06361

BOARD OF LEVEE COMM'RS OF ORLEANS LEVEE DIST V KELLY (PUBLIC RIGHTS IN RE FLOOD CONTROL).
For primary bibliographic entry see Field 04A.
W69-06362

MCKEE V HASLER (LEVEE CONSTRUCTION FOR FLOOD CONTROL).
For primary bibliographic entry see Field 04A.
W69-06363

UNITED STATES V INGRAM (BRIDGE CONSTRUCTION AND RIPARIAN OBLIGATIONS).
For primary bibliographic entry see Field 04A.
W69-06364

CITY OF IRVINE V SMITH (FLOODING CAUSED BY BREAK IN SEWER).
For primary bibliographic entry see Field 04A.
W69-06365

MARINE AIR WAYS, INC V STATE (DEPRIVATION OF ACCESS ROUTES DUE TO BRIDGE CONSTRUCTION).
For primary bibliographic entry see Field 04A.
W69-06366

MCCAUSLAND V JARRELL (OBSTRUCTION OF THE FLOW OF A NATURAL STREAM).
For primary bibliographic entry see Field 04A.
W69-06367

MAGEE V TEXAS CONSTRUCTION CO (FLOODING ABOVE COFFER DAM).
For primary bibliographic entry see Field 04A.
W69-06368

JARVIS V CORNETT (DAMAGES CAUSED BY DIVERSION OF SURFACE WATER).
For primary bibliographic entry see Field 04A.
W69-06369

GRANGER V ELM TREE VILLAGE (DISCHARGE OF EXCESS SURFACE WATER).
For primary bibliographic entry see Field 04A.
W69-06370

DE PIETRO V TRIANO (ESTABLISHMENT OF EASEMENT FOR SURFACE WATER DRAINAGE).
For primary bibliographic entry see Field 04A.
W69-06371

EFNER V KETTERINGHAM (VALIDITY OF EASEMENT TO DRAIN RAIN WATER ONTO ADJOINING LAND).
For primary bibliographic entry see Field 04A.
W69-06372

DIXON V CITY OF NASHVILLE (DAMAGES CAUSED BY DEFLECTION OF SURFACE WATER FLOW).
For primary bibliographic entry see Field 04A.
W69-06373

JOHNSON V CITY OF WINSTON-SALEM (SURFACE WATER DRAINAGE - PIPES).
For primary bibliographic entry see Field 04A.
W69-06374

HORN V BRATTON (SUIT TO ENJOIN MAINTENANCE OF DAM AND DITCH FACILITIES).
For primary bibliographic entry see Field 04A.
W69-06375

NATIONAL MFG CO V UNITED STATES (SOVEREIGN IMMUNITY FROM SUIT FOR FLOOD DAMAGE).
For primary bibliographic entry see Field 04A.
W69-06376

LE CLAIR V SWIFT (ENFORCEMENT OF CONSERVATION STATUTES).
76 F Supp 729-734 (E D Wis 1948).

Descriptors: *Wisconsin, *Lake Michigan, *Fish conservation, *Commercial fishing, Great Lakes, Legislation, Administrative agencies, State governments, Federal government, United States, Wildlife conservation, Nets, Trawling, Lakes, Judicial decisions, Legal aspects, Navigation, Remedies, Damages.
Identifiers: Concurrent jurisdiction, Police powers, Commerce power.

Plaintiff, a commercial fisherman, sought to enjoin the defendant, Director of the State Conservation Commission, from enforcing certain Wisconsin conservation laws which enabled the defendant to seize any wildlife unlawfully taken. Specifically

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outlawed was the use of any unlicensed net and the use of any boat in violation of conservation laws. The plaintiff contended that the enforcement of these laws contravened a federal statute prohibiting interference with navigation on the Great Lakes. The court held that the right of the federal government to control navigation on the Great Lakes and the right of the State of Wisconsin to regulate fishing on those waters within its boundaries were concurrent and not in conflict. Plaintiff's contentions were found to be without merit. (Katz-Fla) W69-06377

FEDERAL POWER COMMISSION V NIAGARA MOHAWK POWER CORPORATION (STATUS OF STATE WATER RIGHTS UNDER FEDERAL WATER POWER ACT OF 1920).

347 US 239-259 (1954).

Descriptors: *United States, *Federal-state water rights conflicts, *Usufructuary rights, *Amortization, Powerplants, Legislation, Obstruction to flow, Navigable rivers, River regulation, Running waters, Federal jurisdiction, State jurisdiction, Water permits, Diversion, Federal project policy, Water utilization, Proprietary power, Hydroelectric power.

Identifiers: *Federal Power Commission, Niagara River, Corporal hereditaments, Dominant servitudes.

The Federal Power Commission brought this proceeding to determine defendant's amortization reserve liability required under the Federal Water Power Act of 1920. Defendant had secured a license from the Commission authorizing diversion of water from the Niagara River for power purposes. Defendant's license required a reserve of 50% of its surplus earnings. In computing defendant's reserve, the Commission disallowed certain expenses paid for defendant's use of private water rights existing under state law and included these amounts in defendant's required reserve. While the court recognized the dominant servitude in favor of the United States under which private persons hold physical properties obstructing navigable waters of the United States, the exercise of that servitude without making allowance for pre-existing rights under state law required clear authorization. The court declared that neither the Federal Water Power Act nor defendant's license expressly abolished existing property rights in the use of the Niagara River. The Act merely imposed upon owners of riparian water rights an obligation to use them in compliance with the Act. The court concluded that, although defendant's water rights were within the scope of the government's dominant servitude, the government had not exercised its power to abolish them, and, therefore, defendant's expenses were not unreasonable. (Reed-Fla) W69-06378

NIAGARA MOHAWK POWER CORP V FEDERAL POWER COMM'N (USUFRUCTUARY RENTAL AS AN OPERATING EXPENSE).

202 F 2d 190-211 (DC Cir 1952).

Descriptors: *United States, *New York, *Usufructuary right, *Federal Power Act, Legislation, Operation and maintenance, Streams, Administrative agencies, Riparian rights, Hydroelectric power, Hydroelectric plants, State governments, Public use, Easements, Water falls, Judicial decisions, Legal aspects, Utilities, Public utilities. Identifiers: Water Power Act, Federal Power Commission.

Under the Water Power Act of 1920, the petitioner was required to set aside an amortization reserve in proportion to surplus earnings. The petitioner deducted, as operating expense, the amount of certain rental payments to the owners of certain usufructuary rights which were interfered with by petitioners. The Federal Power Commission refused to allow this deduction and ordered the

petitioner to increase its amortization reserve accordingly. The Commission asserted that the alleged usufructuary rights did not exist since there cannot be private ownership of the waters of a navigable stream. The court held that, under the laws of New York, usufructuary rights existed but were subject to the paramount right of the state to utilize the waters for a public purpose without payment of compensation therefor. The court refused to recognize the Commission's decision that a usufructuary right was the equivalent of ownership of the water. The Commission contended the Water Power Act declared the waters of the Niagara to be essential to navigation, thereby extinguishing these usufructuary rights. The court, examined a 1910 treaty with Canada and determined that the Water Power Act was not intended to extinguish these private rights. (Katz-Fla) W69-06379

CROSS V PACE (DAMAGE TO UNITED STATES CITIZENS BY FOREIGN DAM).

For primary bibliographic entry see Field 04A. W69-06380

JACKSON V UNITED STATES (PRIVATE PROPERTY RIGHTS IN FISHING GROUNDS).

103 F Supp 1019-1021 (Ct Cl 1952).

Descriptors: *Commercial fishing, *Maryland, *Eminent domain, *Damages, Property values, Navigable waters, Fishing, Federal government, Navigation, Remedies, Judicial decisions, Legal aspects, Permits, Eminent domain, United States, Compensation.

Identifiers: Fishing rights, Spesutic Island, Chesapeake Bay, Commerce clause.

Plaintiff, on the basis of his earlier fishing activity, obtained a license from the State of Maryland allowing him to continue fishing off the eastern shore of Spesutic Island, in Chesapeake Bay. This license could be sold or devised, or passed to his estate upon his death. In 1943, defendant enlarged a nearby weapons proving ground which included plaintiff's fishing area. Plaintiff was unable to get a license to fish elsewhere and filed a claim against the United States. The court of claims found that the plaintiff had a property right in his fishing ground. While the government may forbid the private use of navigable waters to protect and improve navigability, it may not do so for purposes unrelated to commerce. Therefore, plaintiff was entitled to compensation. (Gabrielson-Fla) W69-06381

GUNN V BERQUIST (ADVERSE POSSESSION OF AND RIPARIAN RIGHTS IN TOWN-OWNED RIPARIAN LANDS).

108 NYS 2d 644-647 (Sup Ct 1951).

Descriptors: *New York, *Riparian lands, *Land tenure, *Riparian rights, Cities, Legislation, High water mark, Boundaries (Property), Landfills, Tidal waters, Prescriptive rights, Beds, Bays, Land forming, Legal aspects, Judicial decisions, Relative rights.

Identifiers: *Adverse possession, Tidal lands.

The Town of North Hempstead brought an action to establish its right to possess certain land as fee simple owner. Defendants were the record owners of the property. The western boundary of the land was the mean high water mark of an adjacent bay; all land below this mark was reserved to the town as successor to the sovereign. The town's land, originally submerged, was filled to the extent necessary to support building operations. Defendants asserted title to the filled land by adverse possession. The alleged adverse use was the maintenance of a bathhouse thereon for the required statutory period. The court declared that, since the use of the bathhouse was merely an exercise of defendants' riparian rights and was not hostile to the

town's title, no effective adverse possession had been established. Furthermore, the court observed that tidal lands which a town holds in a governmental capacity may not be alienated; hence, such lands may not be acquired by adverse possession. The court, therefore, ruled that, since defendants had failed to establish title to the parcel by adverse possession, judgment would be directed for the town. (Reed-Fla) W69-06382

WHITSON V MORRIS (TITLE TO RE-FORMED ALLUVIAL LAND).

304 Ky 447, 201 SW 2d 193-197 (1946).

Descriptors: *Kentucky, *islands, *Mississippi River, *Land forming, Alluvium, Erosion, Accretion (Legal aspects), Proprietary power, Beds, Riparian land, Patents, Boundaries (Property), Low water mark, Watercourses (Legal), Washouts, Relative rights, Ownership of beds, Land tenure, River beds.

Identifiers: *Adverse possession.

Plaintiffs brought action to quiet title to alluvial land which had been reformed after the original soil had been submerged by the Mississippi River. The river had cut a deep semicircle in the locus in quo and submerged much land. At approximately the same time, plaintiffs' predecessors in title obtained patents to an island which had formed across from the lands in question. Later, the river returned to its original bed, most of the island disappeared, and the washed out sections of the mainland reappeared. Plaintiffs claimed the reformed lands as accretions to the island. Defendants also claimed the land and charged that no part of the tract involved was embraced by the grants to plaintiffs' predecessors. The court declared that where a permanent island has been patented apart from the mainland, the mainland owner's title to the stream bed extends to the center line between the island and the shore. Therefore, the right to accretions belongs equally to the owners of the island and the owners of the mainland. The evidence showed that the island patented to plaintiffs' predecessors was not contiguous to the mainland, and that the alluvial land was formed by accretion to the mainland and not to the island. Title was quieted in defendants. (Reed-Fla) W69-06383

ANDERSON-TULLY CO V MURPHREE (OWNERSHIP OF PROPERTY LOST BY AVULSION).

153 F 2d 874-883 (8th Cir 1946).

Descriptors: *Arkansas, *Land tenure, *Islands, *Avulsion, Boundaries (Property), Riparian land, Riparian rights, Judicial decisions, Taxes, Navigable rivers, Mississippi River, Ownership of beds, High water mark, Public lands, Beds, Navigable waters, Legislation, Accretion (Legal aspects).

Identifiers: Adverse possession.

Plaintiff brought an action to quiet title to land and to eject the defendant. Land which the plaintiff lost due to avulsion had subsequently reappeared in the form of an island. The defendant then acquired title to this island from the State and began to pay taxes on it. The defendant based his title on a statute which declared that all islands which formed in the navigable waters of the State were the property of the State. However, the court entered a judgment for the plaintiff on the basis of a subsequent statute. This later statute provided that all islands forming in navigable waters became property of the state, except in the case of avulsion. If an island was formed by avulsion, the owner retained title to the submerged land and to any islands subsequently formed therefrom. The island in question formed within the original boundaries of the plaintiff's property; therefore, it still belonged to the plaintiff. The State could not take away what it had previously unconditionally granted. (Stewart-Fla) W69-06384

WUNDERLICH V CATES (DISPUTE OVER TITLE TO AN ISLAND IN THE MISSISSIPPI RIVER).

212 SW 2d 556-565 (Ark 1948).

Descriptors: *Arkansas, *Islands, *Land tenure, *State governments, Boundary disputes, Judicial decisions, Mississippi River, Navigable rivers, Taxes, Tennessee, Public lands, Land use, Invasion, Avulsion, High water mark, State jurisdiction, Boundaries (Property), Accretion (Legal aspects). Identifiers: *Adverse possession, *Injunctions (Prohibitory).

Plaintiff brought suit to restrain the defendant from trespassing upon an island in the Mississippi River. The plaintiff contended that the island was in Arkansas. The defendant claimed ownership of the property by virtue of a Tennessee deed. The plaintiff introduced evidence tending to show that Tennessee had acquiesced in the possession of the land by Arkansas citizens and residents. The residents of the island had served on Arkansas juries, paid Arkansas taxes, and sent their children to Arkansas schools. In addition, the residents refused to recognize Tennessee sovereignty. Despite all this, the court entered a judgment for the defendant, ruling that the land belonged to Tennessee. It held that the Tennessee deed was *prima facie* evidence of ownership and that Tennessee's right to the property could not be lost by adverse possession or acquiescence. Furthermore, a recent property survey showed the land to be in Tennessee. (Stewart-Fla)
W69-06385

HAUBER V GENTRY (OWNERSHIP OF LAND FORMED BY ACCRETION).

215 SW 2d 754-759 (Mo 1948).

Descriptors: *Missouri, *Land tenure, *Riparian lands, *Islands, Accretion (Legal aspects), Judicial decisions, Missouri River, Navigable rivers, Banks, Embankments, Channels, Low water mark, Riparian rights, Watercourses, Alluvion, State governments, Shores, Land forming, Boundaries (Property).

Identifiers: Ejcement.

Plaintiff brought suit to eject the defendant from land formed by accretion. The plaintiff's land was located on a river bank; defendant owned an island in that river. The accretion formed on one side of the island, and the island eventually became attached to the shore. The court affirmed a judgment for the defendant, holding that riparian owners do not own below the low water mark of the Missouri River. Therefore, the plaintiff did not acquire title to accretion which joined the island to the shore. If an island, by reason of accretion, unites with the shore, the accretion is part of the island, not the mainland. The riparian owner's land is not extended. Since the soil build-up began on the island gradually extending shoreward, the contiguity is with the island, not the mainland. (Stewart-Fla)
W69-06386

PETERSON V HARPST (ADVERSE POSSESSION OF ISLAND AND ACCRECTIONS THERETO).

247 SW 2d 663-668 (Mo 1952).

Descriptors: *Missouri, *Accretion (Legal aspects), *Islands, *Missouri River, Judicial decisions, Prescriptive rights, Patents, Silts, River beds, Proprietary power, Sedimentation, Legislation, Relative rights, Boundaries (Property), Local governments, Land tenure. Identifiers: *Adverse possession.

Successors in interest of the record owner of an island instituted action to determine title to the island. Plaintiffs supported their claim with evidence of various conveyances made by the county to their predecessor in title. Defendant

claimed title by adverse possession, alleging that he had been in possession of and had erected improvements on the island and on accretions thereto. Plaintiffs countered that defendant did not have color of title and that neither they nor their predecessor had notice of defendant's claim of ownership. The court stated, that while some writing should be shown purporting to convey land in order to establish color of title, there is no necessity that an adverse claimant shall have had color of title to land actually possessed. The court was of the opinion that the evidence sustained the finding that defendant possessed the island for more than the prescriptive period and, thus, that defendant's title had been established by adverse possession. Moreover, the court held that accretions became part of the land to which they become affixed. Thus, title to the island, whether acquired by deed or by adverse possession, constitutes good title to any accretions which subsequently became a part thereof. (Reed-Fla)
W69-06387

LAKE FRONT EAST 55TH STREET CO V CITY OF CLEVELAND (ESTABLISHMENT OF BOUNDARY LINES).

66 NE 2d 328-329 (Ohio Ct App 1941).

Descriptors: *Ohio, *Boundaries (Property), *Boundary disputes, *Accretion (Legal aspects), Legal aspects, Judicial decisions, Navigable waters, Great Lakes, Damages, Riparian rights, Cities, Local governments, Shores, Relative rights, Land tenure, Compensation, Competing uses.

Plaintiff brought this action to establish the boundary lines of land formed by accretion on the shore of Lake Erie. An earlier decision by the state supreme court had established that plaintiff owned the land but had failed to set out the boundaries. In the present case, the court held that a decree should be entered quieting title in the plaintiff. The court established the easterly and westerly boundaries of the property in the same locations as were fixed in an earlier action. The boundary line, as established, included gradual accretions within the tract, and plaintiff was held to possess riparian rights in respect of this land. The court remanded for a decision on the issue of compensation to the plaintiff for land taken and for any damages to the residue. (Shevin-Fla)
W69-06388

AMERADA PETROLEUM CORPORATION V CASE (ACCRETION OF LAND).
210 La 630, 27 So 2d 431-432 (1946).

Descriptors: *Louisiana, *Lakes, *Ownership of beds, *Accretion (Legal aspects), Shores, Streams, Navigable waters, Running waters, Sediments, Mineralogy, Oil, Oil wells, Legal aspects, Judicial decisions, State governments, Standing water, Alluvion, Adjudication procedure, Riparian land, Relative rights.

Identifiers: Concursus proceeding.

Plaintiff brought this concursus proceeding to determine the ownership of a sum of money deposited by the plaintiff in the registry of the court. The fund was the royalty due from oil produced in a well drilled in the alluvion of a certain lake. Since the plaintiff company had leased the land from both the state and the defendant, the contest for the royalties was actually between the state and the defendant. The lower court had determined that the land on which the well was located was formed by accretion and that the alluvion belonged to the defendant. The state claimed that the land was part of the lake bed and was not accretion; if this was true, then the state had title to the property since it was located under navigable waters. The court held that the land on which the well was located was alluvion formed on the shore of the stream and, therefore, that it belonged to the defendant. The court rejected the state's contention that the land was a deposit of sediment in a sluggish

body of water. Judgment was for the defendant. (Shevin-Fla)
W69-06389

SWAN ISLAND CLUB, INC V WHITE (TITLE TO SUBMERGED LANDS UNDER NAVIGABLE WATERS).

114 F Supp 95-105 (E D NC 1953).

Descriptors: *United States, *Ownership of beds, *Navigable waters, *Non-navigable waters, Hunting, Beds under water, Waterfowl, Legislation, Atlantic Ocean, Judicial decisions, Inland waterways, Shoals, Shallow water, Reefs, Public rights, Tidal waters, Navigation, Legal aspects, Adjudication procedure, Remedies, State governments, Land tenure.

Identifiers: *Torrens proceedings, Collateral attack, Injunctions (Prohibitory).

Plaintiff brought this action to have hunters enjoined from trespassing upon submerged lands adjoining an inland waterway. Plaintiff relied upon state grants and a judgment following a Torrens proceeding to establish title to the submerged lands. The court declared that the waters covering the property were navigable waters, even though they were very shallow in depth. Furthermore, the court pointed out that, at common law, land covered by non-navigable waters could be granted by the state; land covered by navigable waters could not be so conveyed. Since no statute had abrogated the common law rule, the state never had power to grant lands under navigable waters. Therefore, the court concluded that insofar as the court in the Torrens proceeding adjudged plaintiff to be the fee simple owner of the shoal lands under navigable waters, that decree transcended the court's power and thus was open to attack in this action. The court held that the evidence failed to establish plaintiff's title to the submerged lands, and, thus, injunctive relief should be denied. The court further concluded that the public has the right to use navigable waters over privately owned beds, and this right includes the right to hunt and take wild game. (Reed-Fla)
W69-06390

IN RE EASTERN TRANSPORTATION CO (ABANDONMENT OF VESSELS IN NAVIGABLE WATERS).

102 F Supp 913-918 (D Md 1952).

Descriptors: *Maryland, *Navigable waters, *Barriers, *Vessels, Navigation, Legislation, Storms, Federal jurisdiction, Judicial decisions, Legal aspects, Local governments, Federal government, Obsolescence, Cities.

Identifiers: *Obstruction of navigable waters, *Sunken vessels, *Abandonment, *Wreck act, Barges, Bankruptcy.

The referee in bankruptcy issued an order authorizing the bankrupt to abandon four obsolete, worthless barges at their place of anchorage. The order was opposed by the Corps of Engineers and the City of Baltimore. The opponents claimed the order violated the Wreck Act and a certain local ordinance, both of which laws required owners to remove unauthorized obstructions in navigable waters. Removal and sinking in deep water would have cost thousands of dollars, and the trustee claimed the barges were liabilities which could thus be abandoned pursuant to the Bankruptcy Act. The district court held that the referee erred in his decisions and that the Wreck Act applied to all obstructions allowed by the owner to sink, unless such sinking was caused by perils of the sea. The court held that the Bankruptcy Act granted no immunity for abandoning the barges, regardless of bankrupt's financial status. In a supplemental opinion, the court found that one barge had sunk due to a storm and was abandoned prior to the bankruptcy proceedings. Thus, the trustee never took possession of the barge, and the company was exempt

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from the requirement to remove it due to the manner in which it sank. (Harris-Fla)
W69-06391

UNITED STATES V 1532.63 ACRES OF LAND (DETERMINATION OF FAIR MARKET VALUE IN CONDEMNATION PROCEEDING).

86 F Supp 467-477 (WD SC 1949).

Descriptors: *Condemnation value, *Property values, *Electric power production, *Federal government, Federal project policy, Legal aspects, Hydroelectric project licensing, Federal power act, Land tenure, Navigable waters, Eminent domain, Judicial decisions, South Carolina, Condemnation, Compensation, Competing uses.
Identifiers: *Constitutionality, Unitary value.

A South Carolina electrical company acquired, by eminent domain, a large tract of land for use in hydroelectric development. In condemnation proceedings by the United States to acquire and use the tract for the same purpose, the issue of just compensation arose. The district court held that the Fifth Amendment prohibited federal taking of private property for public use without just compensation. Compensation is measured by the value of land for the most profitable purpose for which it is suited, provided that there is sufficient evidence that the land is capable of being used for that purpose. The forum or identity of the condemnor is irrelevant. The fact that land must be combined with other land does not foreclose a valuation based on the combined use. The court held that, although the condemnee acquired the land contingent upon a federal license to use it for power development, a failure to obtain the license did not prevent valuation for hydro-electric purposes. The condemnee has no private property right in power potential, but he is entitled to valuation based on power development of the properties as a unit rather than as separated tracts of agricultural land. (Harris-Fla)
W69-06392

SOLOMON V SIOUX CITY (ACCRETION).

51 NW 2d 472-478 (Iowa 1952).

Descriptors: *Iowa, *Accretion (Legal aspects), *Boundaries (Property), *Riparian rights, Missouri River, Dikes, Jetties, Banks, Obstruction to flow, Municipal water, Local governments, Judicial decisions, Eminent domain, Channel flow, Channels, Public rights, Legal aspects, Barriers.

Plaintiff brought action to quiet title to land claimed as accretion. Defendant city claimed the land was not accretion and that public rights superseded those of individual owners. The court found that the doctrine of accretion applied to the Missouri River, notwithstanding its rapid channel shifts, and that the accretion involved met the 'gradual and imperceptible growth' test adopted by the Iowa Courts. The accretion was caused by dikes built by the government. Plaintiff was not barred by the fact that the accretion was caused by artificial means since he had no control over the artificial barriers. A 1940 patent issued to the city by the state did not grant to the city any right to the accreted land since government lands lose and gain by accretion the same as land of individual owners and a channel shift prior to the 1940 patent had vested title in the riparian owners. The court held that public rights do not supersede those of individual riparian owners. Riparian owners rights can be taken from them only through exercise of the power of eminent domain. The court remanded to the lower court to establish exact boundary lines. (Kahle-Fla)
W69-06393

WILLIAMS V DIEDERICH (SUIT TO ENJOIN RECREATIONAL TRESPASS ON RESERVOIR).

233 SW 2d 402-404 (Mo 1949).

Descriptors: *Missouri, *Land tenure, *Reservoir sites, *Recreation, Railroads, Boating, Fishing, Reservoirs, Preferences (Water rights), Priorities, Judicial decisions, Legal aspects, Competing uses, Prescriptive rights, Leases.

Identifiers: Trespass, Injunctions (Prohibitory), Adverse possession.

Plaintiff brought this suit against defendant to determine whether fishing and boating rights in a reservoir to be constructed were assignable and inheritable. Both plaintiff and respondent asked for injunctive relief to prohibit trespassing on the tract of land where the reservoir was to be situated. The grantors of the land had separately conveyed adjoining tracts of land to a railroad, reserving to themselves, jointly, the exclusive boating and fishing privileges on any reservoir which the railroad constructed. Plaintiff initially filed a claim seeking the injunctive relief based upon his purchase of land from one of the original grantors and on a 20 year lease with the railroad for exclusive use of the reservoir. The court held that since the original deed between grantors and railroad did not contain the words 'heirs and assigns' and since neither grantor named the other as grantee, the privileged use of fishing and boating rights upon the reservoir was personal and not assignable or inheritable. Therefore, defendants had no valid claim. Furthermore, in response to defendant's claim of ownership by adverse possession, the court reasoned that evidence of past fishing and boating on the reservoir constituted merely occasional trespasses and were insufficient to give defendants title. (Logan-Fla)
W69-06394

SHAFFER V WILKINSON (WATER RIGHTS AND EASEMENT).

Cambria County Reports Vol 16, pp 101-110 (C P Pa 1949).

Descriptors: *Pennsylvania, *Streams, *Pipelines, *Spring waters, Coal mines, Legal aspects, Judicial decisions, Easements, Hydraulic structures, Competing uses, Pipes, Mineral industry, Land tenure, Water supply, Water sources, Easements.

The plaintiff brought this action in trespass for destruction of a spring and a pipeline which supplied water to plaintiff's residence. The plaintiff's deed, given by the common grantor of all the parties, expressly ceded to plaintiff the right to use the waters of the spring and to maintain the pipeline across defendant's property. The court noted that defendant knew of plaintiff's rights and, through the exercise of reasonable care could have avoided injuring plaintiff. The court felt that defendant had commenced coal mining excavation in disregard of plaintiff's interests. The court awarded damages to plaintiff on the basis of the cost of restoration of the spring and pipeline. (Katz-Fla)
W69-06395

ANDERSON-TULLY CO V TINGLE (ACCRETION TO LAND LOCATED WITHIN THE FORK OF TWO RIVERS).

166 F 2d 224-229 (5th Cir 1948).

Descriptors: *Mississippi, *Accretion (Legal aspects), *Boundaries (Property), *Riparian land, State jurisdiction, Thalweg, Mississippi River, Navigation, Avulsion, Erosion, Degradation (Stream), Scour, Creep, Streams, Judicial decisions, Legal aspects, Federal jurisdiction, Riparian rights, Land forming, Geomorphology.

Plaintiffs brought this action to recover the value of timber cut from lands adjacent to the Mississippi River. Plaintiff claimed title to the property on which the timber was located. The defendants claimed title to the same land on the theory that where there is one owner of all the land in a fork between two rivers which constitute the boundaries of that tract, all accretions which form between the two rivers belong to the owner of the land in the fork and not to the owner of the lands across either

river. The court found that, in determining title to the accretions, the same rules are applicable as where one river forms a boundary. Imperceptible accumulations of soil inure to the benefit of the riparian owner on whose side of the thalweg, or stream thread, the accreted material accumulates. In the instant case, as one river had ceased to flow, the court found it necessary to permanently affix the location of the thalweg as of the date at which the river ceased to flow. (Katz-Fla)
W69-06396

PERSON V JOHNSON (TITLE TO BEDS UNDER NON-NAVIGABLE LAKES).

235 SW 2d 876-881 (Ark 1950).

Descriptors: *Arkansas, *Ownership of beds, *Riparian land, *Non-navigable waters, Judicial decisions, Legal aspects, Lakes, Riparian rights, Water law, Beds under water, Boundaries (Property), Fences, Shores.

Identifiers: Recording acts, Chain of title, Partition suits.

Appellant claimed that his property, located on the southern side of a non-navigable lake, was circumscribed by the northern shore of the lake. Appellee owned the property bordering on the northern shore. The source of each party's claim of title was a partition suit in which the agreed separation line was a fence constructed in the center of the lake. Appellant based his claim of ownership to the northern shore on transactions subsequent to the partition suit in which his boundary was expressly described as the north shoreline. The court held that appellee's title extended to the center of the lake. The court upheld the conveyances relied on by appellant but indicated that none of the parties to such conveyances had intended an obvious invasion of appellee's riparian rights. The general rule is that, when a tract of land borders on a non-navigable stream or lake, the riparian proprietor is deemed to own the bed to the center of the water body. (Holt-Fla)
W69-06397

JOHNSON V SMITH (TITLE TO BEDS UNDER NON-NAVIGABLE LAKES).

219 SW 2d 926-929 (Ark 1949).

Descriptors: *Arkansas, *Beds under water, *Ownership of beds, *Riparian land, Judicial decisions, Legal aspects, Water law, Non-navigable waters, Lake beds, Riparian rights, Remedies, Boundaries (Property), Relative rights, Lakes.

Identifiers: Recording acts, Constructive notice, Implied actual notice.

Appellants owned property on the east side of a non-navigable lake, and appellees owned the property bordering on the west side of the lake. Appellees had previously owned the property on both sides, but, through purchase at a foreclosure sale, appellants predecessor in interest obtained title to the east side tract. Through an agreement, and according to a recorded deed, this property was to extend to the eastern border of the lake. When appellants obtained title, the property was again described as extending to the eastern border of the lake. Appellants contended that, as riparian owners, they owned to the center of the lake bed. Appellees claimed title to the entire bed of the lake. The court stated that, as to riparian owners on each side of a non-navigable lake, the presumption is that each riparian owner owns to the center of the lake; however, the court held that the appellees owned title to the entire bed based on the description in their recorded deed. (Holt-Fla)
W69-06398

LOUGHREN V MATYLEWICZ (EASEMENTS ON NON-NAVIGABLE WATERS).

367 Pa 593, 81 A 2d 879-882 (1951).

Nonstructural Alternatives—Group 6F

Descriptors: *Ownership of beds, *Pennsylvania, *Prescriptive rights, *Backwater, Dams, Easements, Overflow, Water rights, Riparian rights, Ponds, Non-navigable waters, Remedies, Legal aspects, Judicial decisions, Recreation, Relative rights, Fishing, Boating.
 Identifiers: Injunctions (Prohibitory).

Plaintiffs sought to enjoin interference with their lawful possession of a certain non-navigable pond. Plaintiffs charged the defendants, owners of land bordering on the pond, with trespassing by attempting to transform the pond into an amusement center. The lower court held for the plaintiff. This court affirmed, holding that the plaintiff had good title to the pond and that mere casual and sporadic use of the pond by appellants did not ripen into an easement by prescription. The court found that defendant's claim that plaintiff's construction of a two foot dam at the pond's outlet caused it to overflow onto defendant's land was invalid since, at the time defendants purchased their land, a six foot dam was already in existence. (Gabrielson-Fla)
 W69-06399

KRAFT V MILLER (ARTIFICIAL CONTROL OF SURFACE WATERS).
 For primary bibliographic entry see Field 04A.

W69-06400

STATE V SENSENBRENNER (RIPARIAN RIGHTS REGARDING NATURAL DAMS).
 For primary bibliographic entry see Field 04A.

W69-06401

BAYLEN STREET WHARF CO V CITY OF PENSACOLA (DAMAGES TO LAND BY STORM SEWER REFUSE).

39 So 2d 66-68 (Fla 1949).

Descriptors: *Florida, *Storm drains, *Fisherries, *Cities, Commercial fishing, Docks, Sewage disposal, Landfills, Municipal wastes, Oil wastes, Beds, Boats, Taxes, Damages, Legal aspects, Judicial decisions, Real property, Ownership of beds, Silts, Remedies.
 Identifiers: Injunctions (Mandatory)

The respondent city filed a complaint against the petitioner to foreclose certain tax liens. After his counterclaim was dismissed, petitioner filed a complaint asking that the city be enjoined from operating a certain storm sewer that was discharging refuse onto the petitioner's land. This complaint was also dismissed, and this appeal followed. The court acknowledged the general rule that a counterclaim will not be permitted as a defense to a tax lien suit; however, this case was an exception. The petitioners alleged that their property was suited only for maritime purposes, that the refuse from the storm sewer was destroying its usefulness and that the value of the land was continually declining. The court stated that if the claims were proven, the petitioner would be entitled to relief. The court held that a municipality cannot set in motion an agency which continually destroys ones property and at the same time insist on the payment of taxes thereon. The court further stated that water bottoms rendered worthless are not taxable. The court reinstated petitioner's counterclaim and remanded the case to the lower court for a verdict on the evidence. (Shevin-Fla)
 W69-06402

NATURAL RESOURCES.
 For primary bibliographic entry see Field 04A.

W69-06403

POLLUTION OF WATERS BY RAILROADS AND FACTORIES.
 For primary bibliographic entry see Field 05G.

W69-06404

NIAGARA MOHAWK POWER CORP V FEDERAL POWER COMM'N (USUFRUCTUARY RIGHTS AND THE FEDERAL WATER POWER ACT OF 1920).

For primary bibliographic entry see Field 06C.
 W69-06405

ATTORNEY GENERAL V CITY OF WOBURN (POLLUTION OF RIVER BY CITY).

For primary bibliographic entry see Field 05G.
 W69-06406

POLLUTION OF WATERS.

For primary bibliographic entry see Field 05G.
 W69-06407

DYER V SIMS (ENFORCEMENT OF INTERSTATE POLLUTION CONTROL COMPACTS).

For primary bibliographic entry see Field 05G.
 W69-06408

MASSEY V MASONITE CORP (OVERFLOW OF EFFLUENTS INTO PRIVATE LAKE).

For primary bibliographic entry see Field 05G.
 W69-06409

ANTHONY V HUNTLEY ESTATES (DAMAGES FOR POLLUTION OF STREAM).

For primary bibliographic entry see Field 05G.
 W69-06410

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06411

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: DEVELOPMENT OF NONLIVING MARINE RESOURCES).

Commission on Marine Science, Engineering and Resources, Washington, D. C.

For primary bibliographic entry see Field 06B.

W69-06412

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: NATURAL GAS).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.

W69-06413

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: OTHER MARINE MINERALS).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06414

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: LEGAL AND REGULATORY CONSIDERATIONS).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06415

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: FRESH WATER RESOURCES).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06416

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: AN INTERNATIONAL LEGAL-POLITICAL FRAMEWORK FOR EXPLORING AND EXPLOITING THE MINERAL RESOURCES UNDERLYING THE HIGH SEAS).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06417

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART III: AN INTERNATIONAL AUTHORITY TO REGISTER NATIONAL CLAIMS BEYOND THE REDEFINED CONTINENTAL SHELF).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06418

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION, PART IV: GOVERNMENT-INDUSTRY RELATIONSHIPS IN SUPPORT OF RESEARCH DEVELOPMENT).

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06419

OUR NATION AND THE SEA (A PLAN FOR NATIONAL ACTION): ORGANIZING A NATIONAL OCEAN EFFORT.

Commission on Marine Science, Engineering and Resources, Washington, D. C.
 For primary bibliographic entry see Field 06B.
 W69-06420

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, UPPER FLINT RIVER, MUD AND JESTER CREEKS, METROPOLITAN ATLANTA, GEORGIA.

Corps of Engineers, Mobile, Ala.
 For primary bibliographic entry see Field 04A.
 W69-06057

FLOOD PLAIN INFORMATION, CASEY CANAL NORTH, SAVANNAH AND CHATHAM COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.
 For primary bibliographic entry see Field 04A.
 W69-06058

FLOOD PLAIN INFORMATION, TAR RIVER AND STONY CREEK, ROCKY MOUNT, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.
 For primary bibliographic entry see Field 04A.
 W69-06059

FLOOD PLAIN INFORMATION, COBBS CREEK-FOWLER BRANCH, DEKALB COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.
 For primary bibliographic entry see Field 04A.
 W69-06060

FLOOD PLAIN INFORMATION, ROCK RIVER AT JANESVILLE, WISCONSIN.

Corps of Engineers, Rock Island, Ill.
 For primary bibliographic entry see Field 04A.
 W69-06061

FLOOD PLAIN INFORMATION, BIG WALNUT CREEK, VICINITY OF COLUMBUS, OHIO.

Corps of Engineers, Huntington, W. Va.
 For primary bibliographic entry see Field 04A.
 W69-06062

Field 06—WATER RESOURCES PLANNING

Group 6F—Nonstructural Alternatives

FLOOD PLAIN INFORMATION, HUNNICKUTT CREEK, ATHENS, CLARKE COUNTY, GEORGIA.

Corps of Engineers, Savannah, Ga.

For primary bibliographic entry see Field 04A.
W69-06063

FLOOD PLAIN INFORMATION, TAR RIVER AT LOUISBURG, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.

For primary bibliographic entry see Field 04A.
W69-06064

FLOOD PLAIN INFORMATION, DICKINSON BAYOU, DICKINSON, TEXAS.

Corps of Engineers, Galveston, Tex.

For primary bibliographic entry see Field 04A.
W69-06065

FLOOD PLAIN INFORMATION, ELLERBE, GOOSE, WARREN, SANDY AND THIRD FORK CREEKS, DURHAM, NORTH CAROLINA.

Corps of Engineers, Wilmington, N. C.

For primary bibliographic entry see Field 04A.
W69-06066

FLOOD PLAIN INFORMATION, TURTLE CREEK, ROCK COUNTY, WISCONSIN.

Corps of Engineers, Rock Island, Ill.

For primary bibliographic entry see Field 04A.
W69-06067

FLOOD PLAIN INFORMATION, BEAVERDAM CREEK, PRINCE GEORGES COUNTY, MARYLAND.

Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 04A.
W69-06068

FLOOD PLAIN INFORMATION, OTTAWA RIVER, ALLEN COUNTY, OHIO.

Corps of Engineers, Detroit, Mich.

For primary bibliographic entry see Field 04A.
W69-06069

FLOOD PLAIN INFORMATION, OHIO RIVER, JEFFERSON COUNTY, KENTUCKY.

Corps of Engineers, Louisville, Ky.

For primary bibliographic entry see Field 04A.
W69-06070

WATER AND CHOICE IN THE COLORADO BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT.

National Academy of Sciences—National Research Council, Washington, D. C. Committee on Water.
For primary bibliographic entry see Field 06B.
W69-06086

A FLOOD LOSS REDUCTION PROGRAM,

Gilbert F. White.

Civil Engineering ASCE, Vol 38, No 8, pp 60-62.
Aug 1968. 3 p, 1 tab.

Descriptors: *Flood plain zoning, *Flood plain insurance, *Land use, *Flood damage, Flood protection, Flood control, Federal government, Non-structural alternatives, Public benefits, Legislation, Regulation, Engineering structures, Damages, Environmental engineering.

The efforts of state and federal agencies to secure an integrated flood control program may be jeopardized by hasty action in two areas. (1) A federally subsidized flood damage insurance program may lead to the establishment of premium levels having no relation to risk exposure. If premium rates are not set in relation to hazard, wasteful use of flood plain's would be rewarded. (2) Land use regulations, local zoning and ordinances,

should not be thought of as exclusively negative instruments foreclosing the use of flood plains. If proper safeguards are established, these lands can be utilized. Land use regulation is aimed at preventing threats to public health and not at preventing foolish investment. Private engineering firms will benefit from the dissemination of flood hazard information and technical advice by the Corps of Engineers; such a program will enable private enterprise to intelligently choose between diverse land use alternatives. (Molica-Fla)
W69-06097

Descriptors: *Rainfall simulators, *Samplers, Surface runoff, Water yield, Sediment yield, Equipment.

The device applies water to 16 x 20 foot plots at rates up to 8 inches per hour with kinetic energy approximating that of natural rainfall. It also samples and records the rate of runoff in such a way that sediment production can be measured accurately. The major components are: (1) a 1500 gallon tank truck for transporting water and apparatus, (2) a demountable aluminum framework and moving spray assembly for applying water, and (3) a device for sampling and measuring the rate of runoff. Two men can assemble it and put it in operation in one and a half hours. The sampler takes representative 1.76 plus or minus .03% or 10.68 plus or minus .04% samples.
W69-06011

07. RESOURCES DATA

7A. Network Design

SURFACE WATER HYDROLOGY (GENERAL OUTLINE),

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 02E.
W69-06222

HYDROLOGICAL FORECASTING,

Research Inst. for Water Resources Development, Budapest (Hungary).

For primary bibliographic entry see Field 02A.
W69-06228

HYDROLOGICAL BENCH MARKS,

Geological Survey, Washington, D. C.

W. B. Langbein.

World Meteorol Organ, Int Hydrol Decade Rep No 8, 1968. 8 p, 4 ref.

Descriptors: *Networks, *Hydrologic data, International Hydrological Decade, Regional analysis, Hydrologic budget, Streamflow, Water levels, Discharge (Water), Climatic data, Statistical methods, Water quality.
Identifiers: *Hydrological Bench Marks.

Hydrological bench marks are established to provide a continuing series of consistent observations on climatic and hydrometric data. They are established in areas relatively uninfluenced by past or future artificial changes. Methods of analyzing the hydrological structures of natural catchments are discussed. Stationary time series and analysis of the statistical structure of hydrological time series are briefly described and references are given for more detailed study. The problems of change of hydrological regimen may be solved only by use of internal evidence in the stream in question or by comparison with standard or bench mark streams. An alternative is the use of derived homogeneous data from gaging networks or the use of estimates of ungaged flow derived from climatological networks. The general principles of site selection for bench marks are lack of man-made storage, lack of pumping wells, conditions favorable for gaging and climatic data collecting, and likelihood of small natural changes with time. The catchment area should be between 10 and 100 sq mi. Data to be collected include streamflow, water table level, water chemical analyses, sediment, precipitation, temperatures, evaporation, solar radiation, and stream channel shape changes. The relations of bench marks to climatological reference stations, representative catchments, and vigil stations are described. (Knapp-USGS)
W69-06252

7B. Data Acquisition

A PORTABLE RAINFALL SIMULATOR AND RUNOFF SAMPLER,

New Mexico State Univ., Las Cruces.

J. U. Anderson, A. E. Stewart, and P. C. Gregory.
N Mex Ag Ex Station Res Rept 143, October 1968.
8 p, 7 photo, 1 table, 5 ref. OWRR Project A-004-NMEX.

CONSTRUCTION OF PIEZOMETERS, AND METHOD OF INSTALLATION FOR GROUND WATER OBSERVATIONS IN AQUIFERS, Commonwealth Scientific and Industrial Research Organization, Merbein (Victoria). Div. of Horticultural Research.

J. Groot Obbink.

J Hydrol, Vol 7, No 4, pp 434-443, Apr 1969. 10 p, 9 fig.

Descriptors: *Piezometers, *Observation wells, *Operation and maintenance, Instrumentation, Well casings, Well filter, Wellpoints, Wells, Well screens, Drilling, Aquifers.
Identifiers: Well drilling, Well jetting (Drilling).

Over the period 1952-1963, groundwater studies were carried out by C.S.I.R.O. in various irrigation districts in South Australia, Victoria, and New South Wales. Piezometers were installed to observe the behaviour of groundwater in aquifers underlying these areas. A description is given of 2 types of screens which have been used and the methods of installation by jetting or rotary drilling. A detailed description of jetting equipment is given and the use of both types of screens discussed. The material encountered was recent riverine clays, and sand and one particular piezometer site is illustrated. Testing and maintenance of the installed piezometers are described. (Knapp-USGS)
W69-06019

MEASUREMENT OF PEAK DISCHARGE BY INDIRECT METHODS,

Geological Survey, Washington, D. C.

For primary bibliographic entry see Field 02E.
W69-06251

TRITIUM CONTENT IN THE FIRN LAYERS OF AN ALPINE GLACIER,

Innsbruck Univ. (Austria). Dept. of Physics; and International Atomic Energy Agency (Vienna).

For primary bibliographic entry see Field 02C.
W69-06262

7C. Evaluation, Processing and Publication

NUMERICAL EXPERIMENTS WITH THE STANFORD WATERSHED MODEL ON SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,

Virginia Polytechnic Inst., Blacksburg. Dept. of Agricultural Engineering; and Agricultural Research Service, Blacksburg, Va. Soil and Water Conservation Research Div.

For primary bibliographic entry see Field 02E.
W69-06032

SOLUTION OF ESTUARY PROBLEMS AND NETWORK PROGRAMS,

Rice Univ., Houston. Dept. of Environmental Science and Engineering; and Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.

W69-06077

MATHEMATICAL STATISTICS AS A METHOD FOR HYDROLOGICAL INVESTIGATIONS.
 Research Inst. for Water Resources Development, Budapest (Hungary).
 For primary bibliographic entry see Field 06A.
 W69-06226

THE HYDROLOGIC CYCLE AND THE WATER BALANCE IN NATURE.
 Research Inst. for Water Resources Development, Budapest (Hungary).
 For primary bibliographic entry see Field 02A.
 W69-06227

08. ENGINEERING WORKS

8A. Structures

CARBONATE SCALE IN ROMAN AND MODERN CANALS IN THE JORDAN VALLEY.
 Food and Agriculture Organization of the United Nations, Iraklion (Crete).

H. W. Underhill.

J Hydrol, Vol 7, No 4, pp 389-403, Apr 1969. 15 p., 4 fig, 2 tab, 15 ref.

Descriptors: *Scaling, *Canals, *Calcium carbonate, Hardness (Water), Irrigation water, Spring waters, Arid lands, Irrigation canals.

Identifiers: *Jordan.

Problems of loss of capacity of canals and pipelines carrying waters heavily charged with carbonates are not new; examples are described from classical and modern times in the Jordan Valley. An outline of the chemistry of carbonates in ground water is followed by a discussion of the chemical analyses of two springs in West Jordan. Different indices of calcium carbonate saturation are examined; as none of these indicates the delayed properties of such waters the addition of an 'aerated saturation index' is proposed. The rate of scale formation in the modern Ain Feseyl canal is estimated from chemical analyses. The relation between scale precipitation in man-made works and its formation under natural conditions is noted, and a historical footnote on the probable origin of the scale-filled Roman canal at Ain Feseyl is included. (Knapp-USGS)
 W69-06017

8B. Hydraulics

UNDERGROUND STORAGE OF FLUIDS.
 Michigan Univ., Ann Arbor. Dept of Chemical and Metallurgical Engineering; and Texas Univ.,

Austin. Dept. of Petroleum Engineering.
 For primary bibliographic entry see Field 02F.
 W69-06055

THE EFFECT OF LOOSE BLOCKS ON THE RATE OF SEDIMENT TRANSPORT.
 California Univ., Berkeley. Hydraulic Engineering Lab.
 For primary bibliographic entry see Field 02J.
 W69-06083

8C. Hydraulic Machinery

NORTH COUNTIES HYDROELECTRIC CO V UNITED STATES (DAMAGES RESULTING FROM ICE JAM).
 For primary bibliographic entry see Field 06E.
 W69-06326

CHAPMAN V FEDERAL POWER COMM'N (PRIVATE CONSTRUCTION OF HYDROELECTRIC PLANT AND RIVER BASIN PROJECT).

345 US 153-182 (1953).

Descriptors: *River basin development, *Hydroelectric plants, *Flood control, *Administrative agencies, Power plants, Dams, Electric power, Federal power act, Hydroelectric power, Hydroelectric project licensing, Rivers, Multiple purpose projects, Project planning, Legislation, Construction, Flood control, Navigation, Public utilities.

Identifiers: Corps of Engineers, Federal Power Commission, Department of the Interior, Flood Control Act of 1944.

In 1940 the Army Corps of Engineers recommended to Congress that a system of eleven dams in the Roanoke Basin be constructed as part of a flood control program and hydroelectric power project. The Corps recommended that the plan be under the direction of the Corps but did not clearly state that the project should be constructed by federal personnel. The Federal Power Commission knew of and concurred in the recommended plan. The plan was approved by the Flood Control Act of 1944, and 2 of the 11 recommended dams, were authorized for construction. Subsequently, respondent power company applied to the Federal Power Commission for a license to construct a hydroelectric generating plant at one of the sites. Petitioners, Secretary of Interior, and an association of electric cooperatives challenged the authority to issue the license, claiming that Congress had reserved all sites in the plan for public construction. The court held that congressional approval of the recommended plan did not necessarily reserve the site for public construction and withdrew the Commission's licensing authority. The approved plan never actually recommended public construction of the

site; it merely provided that direction and supervision was the responsibility of the Corps of Engineers. (Helwig-Fla)
 W69-06346

8D. Soil Mechanics

HYDRAULIC OPERATING CHARACTERISTICS OF LOW GRADIENT BORDER IRRIGATION SYSTEMS.
 Colorado State Univ., Fort Collins. Dept. of Agricultural and Irrigation Engineering.
 For primary bibliographic entry see Field 03F.
 W69-06035

SOIL PHYSICS.

Research Inst. for Water Resources Development, Budapest (Hungary).
 For primary bibliographic entry see Field 02G.
 W69-06224

8F. Concrete

BACTERIAL CORROSION OF CONCRETE IN WATER.
 Technical Univ. of Denmark, Copenhagen. Inst. of Hygiene.
 Einer Fjeldingstad.
 Water Res, Vol 3, No 1, pp 21-30, Jan 1969. 10 p., 6 fig, 3 tab, 15 ref.

Descriptors: *Sulfur bacteria, *Corrosion, *Concretes, Acid bacteria, Aquatic bacteria, Soil bacteria, Sulfur, Sulfates, Acids, Corrosion control.
 Identifiers: *Concrete corrosion.

Corrosion of concrete in water occurs in the presence of sulfate and sulfur bacteria. Thiobacillus species can use pyrite as an energy source and release sulfuric acid to the surrounding water, where it corrodes concrete structures. Laboratory tests of concrete-corrosion hazard may be made by inoculating 1 gm of mud from the site with bacterial culture and monitoring pH. Laboratory tests of the growth of various Thiobacillus species show that each has its own narrow pH range, so that with production of acid, there is a succession of species from alkaline-tolerant to acid-tolerant types. (Knapp-USGS)
 W69-06029

8H. Rapid Excavation

UNDERGROUND STORAGE OF FLUIDS.
 Michigan Univ., Ann Arbor. Dept of Chemical and Metallurgical Engineering; and Texas Univ., Austin. Dept. of Petroleum Engineering.
 For primary bibliographic entry see Field 02F.
 W69-06055

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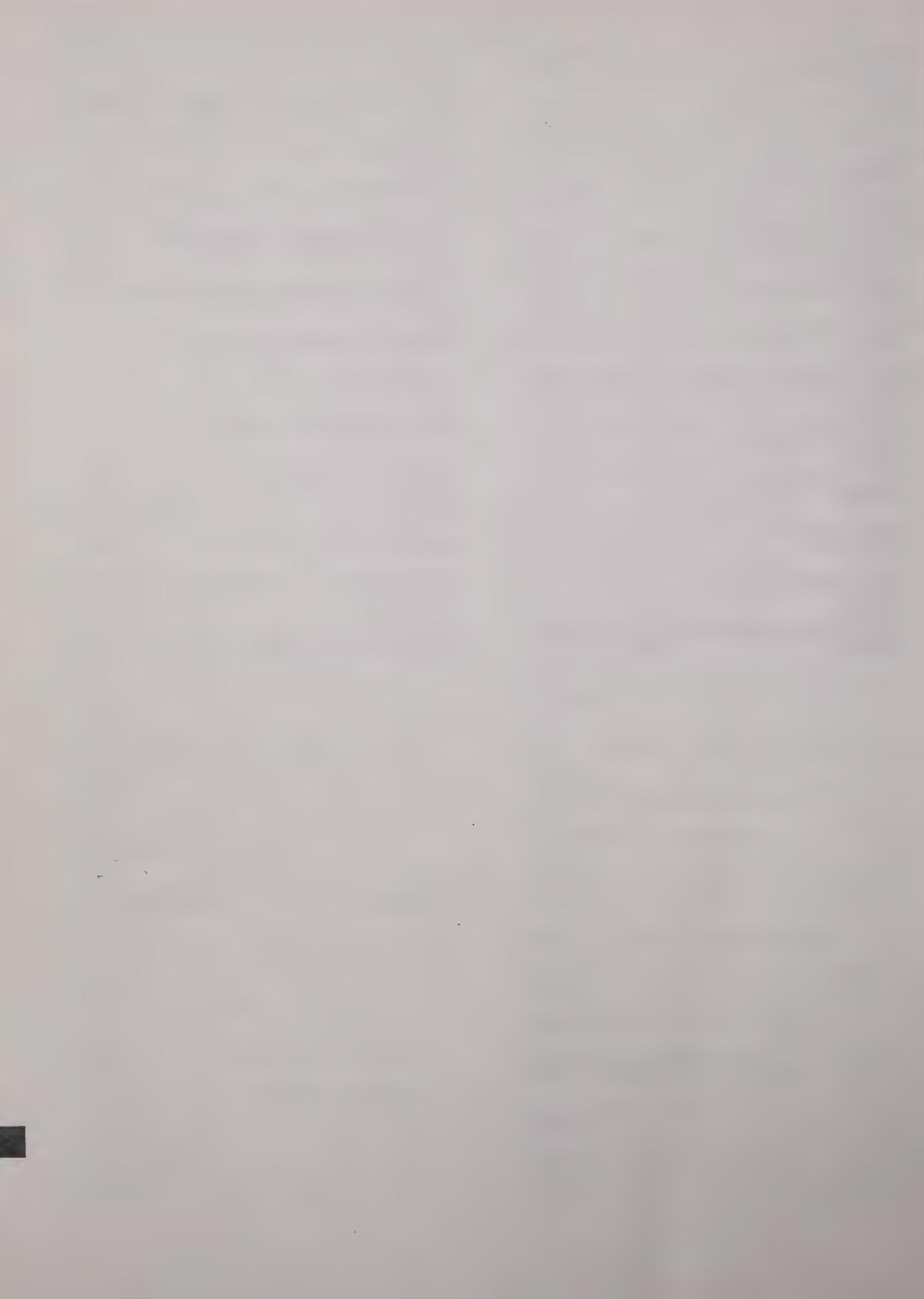
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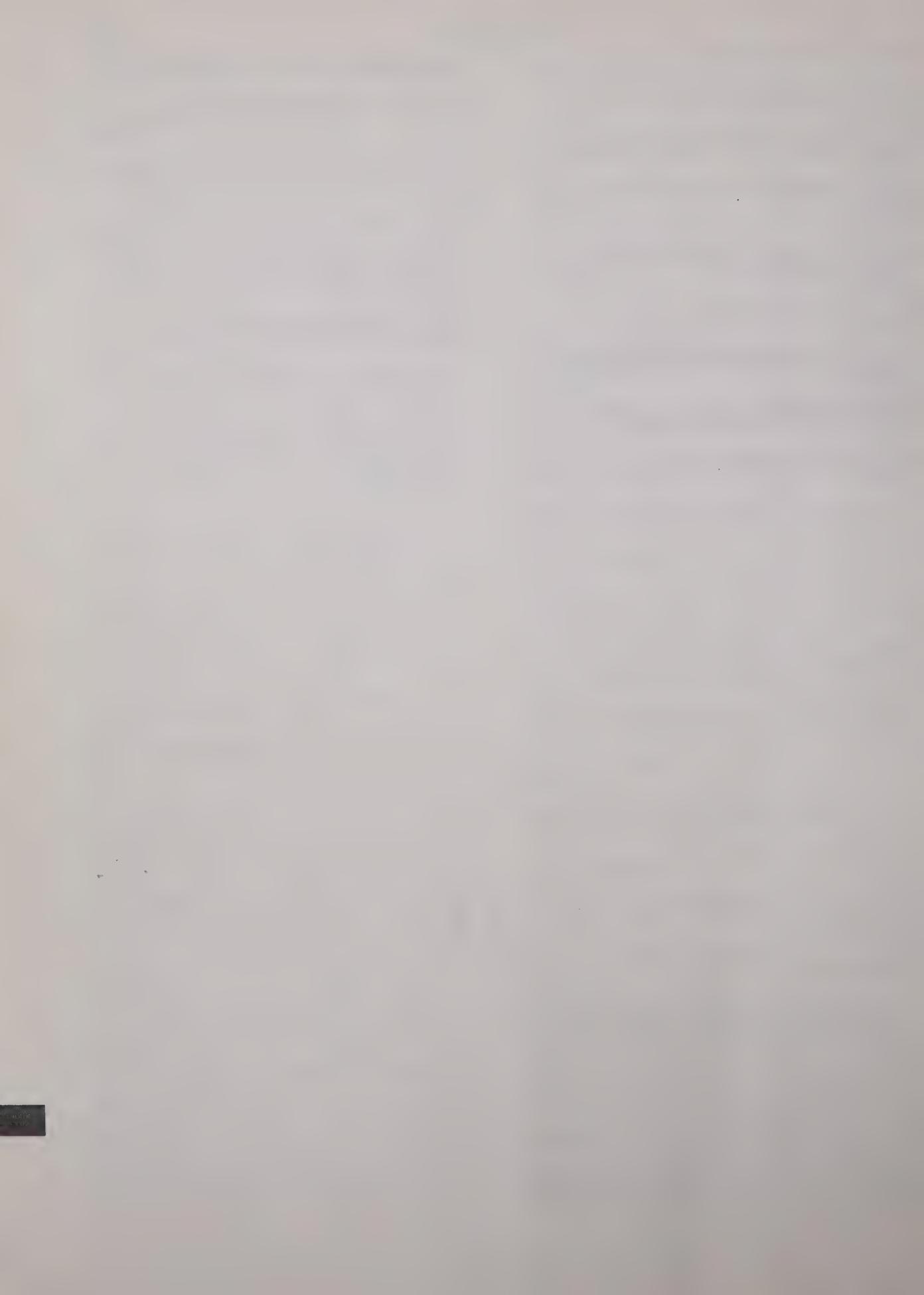
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02F	W69-06052	06E	W69-06139	02E	W69-06222	05G	W69-06305	06E	W69-06389
02F	W69-06053	06E	W69-06140	02F	W69-06223	06B	W69-06306	06E	W69-06390
04B	W69-06054	06E	W69-06141	02G	W69-06224	06E	W69-06307	06E	W69-06391
02F	W69-06055	06E	W69-06142	05G	W69-06225	04C	W69-06308	06E	W69-06392
02E	W69-06056	06E	W69-06143	06A	W69-06226	04A	W69-06309	06E	W69-06393
04A	W69-06057	06E	W69-06144	02A	W69-06227	04A	W69-06310	06E	W69-06394
04A	W69-06058	06E	W69-06145	02A	W69-06228	04A	W69-06311	06E	W69-06395
04A	W69-06059	06E	W69-06146	02E	W69-06229	06E	W69-06312	06E	W69-06396
04A	W69-06060	06E	W69-06146	02F	W69-06230	06E	W69-06313	06E	W69-06397
04A	W69-06061	06E	W69-06147	02E	W69-06231	04C	W69-06314	06E	W69-06398
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04A	W69-06063	06E	W69-06149	04C	W69-06233	05G	W69-06316	06E	W69-06400
04A	W69-06064	06E	W69-06150	04A	W69-06234	03D	W69-06317	04A	W69-06401
04A	W69-06065	06E	W69-06151	05B	W69-06235	06E	W69-06318	04A	W69-06402
04A	W69-06066	06E	W69-06152	02D	W69-06236	06E	W69-06319	04A	W69-06403
04A	W69-06067	06E	W69-06153	05B	W69-06237	06E	W69-06320	05G	W69-06404
04A	W69-06068	06E	W69-06154	04A	W69-06238	04A	W69-06321	06C	W69-06405
04A	W69-06069	06E	W69-06155	04A	W69-06239	04A	W69-06322	05G	W69-06406
04A	W69-06070	06E	W69-06156	04A	W69-06240	04A	W69-06323	05G	W69-06407
02G	W69-06071	06E	W69-06157	04A	W69-06241	04A	W69-06324	05G	W69-06408
02G	W69-06072	06E	W69-06158	04A	W69-06242	03F	W69-06325	05G	W69-06409
02H	W69-06073	06E	W69-06159	04A	W69-06243	06E	W69-06326	05G	W69-06410
02G	W69-06074	06E	W69-06160	04A	W69-06244	06E	W69-06327	06B	W69-06411
02F	W69-06075	06E	W69-06161	04A	W69-06245	06E	W69-06328	06B	W69-06412
02H	W69-06076	06E	W69-06162	04A	W69-06246	06E	W69-06329	06B	W69-06413
02L	W69-06077	06E	W69-06163	04A	W69-06247	05G	W69-06330	06B	W69-06414
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05B	W69-06080	06E	W69-06165	02K	W69-06249	04A	W69-06332	06B	W69-06416
05C	W69-06081	06E	W69-06166	02F	W69-06250	06E	W69-06333	06B	W69-06417
04B	W69-06082	06E	W69-06167	02E	W69-06251	06E	W69-06334	06B	W69-06418
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ABSTRACT SOURCES

	Accession Numbers	Total
A. Center of Competence		
(1) U.S. Geological Survey - Hydrology	W69-06015 -- W69-06085 W69-06201 -- W69-06270	140
(2) University of Florida - Eastern U.S. Water Law	W69-06100 -- W69-06200 W69-06301 -- W69-06420 W69-06094 -- W69-06097	222
(3) University of Wisconsin - Eutrophication	W69-06271 -- W69-06285 W69-06092 -- W69-06093	17
(4) University of Chicago - Metropolitan Water Resource Management	W69-06290 -- W69-06300 W69-06086 -- W69-06090 W69-06098 -- W69-06099	18
(5) Bureau of Reclamation - Engineering Works	W69-06091	1
B. Other		
(1) Office of Saline Water	W69-06286 -- W69-06288	3
(2) University of Nevada - Center for Water Resources Research	W69-06289	1
(3) Texas Technological College - Water Resources Center	W69-06001	1
(4) University of Texas - Center for Re- search in Water Resources	W69-06002 -- W69-06005	4
(5) University of Hawaii - Water Resources Center	W69-06006	1
(6) New Mexico State University - Water Resources Research Institute	W69-06007 -- W69-06008 W69-06010 -- W69-06013	6
(7) Georgia Institute of Technology - Water Resources Center	W69-06009	1
(8) Kansas State University - Water Re- sources Research Institute	W69-06014	1
	Grand Total	416

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Title	Author	Organization	SWRA Abstract (Ref. to Vol. 2, 1969)
Effects of Urbanization on Unit Hydrographs for Small Watersheds, Houston, Texas, 1964-67 (2 vols)	W.H. Espey, Jr., D.E. Winslow	TRACOR, Inc.	No. 6, p. 2, W69-02354
Main I, A System of Computerized Models for Calculating and Evaluating Municipal Water Requirements (2 vols)		Hittman Assoc., Inc.	No. 9, p. 56, W69-03201
Main I, A System of Computerized Models for Calculating and Evaluating Municipal Water Requirements (two magnetic tapes \$75 each; tape one, Library of Water Usage Parameters, tape two, Source Language Programs)		Hittman Assoc., Inc.	No. 9, p. 56, W69-03202
A Study to Determine the Cost of Water In Industrial Uses	H.C. Bramer D.J. Motz	Cyrus W. Rice & Co.	No. 9, p. 55, W69-03322
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A Critical Review of Methods of Measuring Discharge Within A Sewer Pipe	H.G. Wenzel, Jr.	American Society of Civil Engineers	No. 9, p. 66, W69-03510
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A Discussion of the Dispersion Tensor for a Turbulent Uniform Channel Flow	C. Dagan	Hydronautics, Inc.	No. 10, p. 4, W69-03704
Calculation of Dispersion Coefficient in Straight Prismatic Streams	C.L. Yen C. Elata	Hydronautics, Inc.	No. 10, p. 4, W69-03705
Urban Water Resources Research; Systematic Study and Development of Long-Range Plans, First Year Report, September 1968		American Society of Civil Engineers	No. 9, p. 50, W69-03506

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- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
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- 5 WATER QUALITY MANAGEMENT AND PROTECTION
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